

A R I T H M E T I C
IN THE
Plainest and most concise METHODS hi-
therto EXTANT.

WITH
NEW IMPROVEMENTS,
For Dispatch of BUSINESS in all the several
R U L E S.

AS ALSO
FRACTIONS Vulgar and Decimal
wrought together after a new Method,
that renders both easy to be understood
in their NATURE and USE.

The whole Perus'd and Approved of, by the most
eminent Accomptants in the several Offices of the
REVENUE, viz. *Customs, Excise, &c.* as the only
Book of its kind, for Variety of R U L E S and
Brevity of WORK.

The ELEVENTH EDITION.

With considerable Additions, and curious Improvements, by
the AUTHOR,

GEO. FISHER, Accomptant.

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To the Right Worshipful

Sir SAMUEL CLARKE *Knt.*

And Merchant of the Honourable

CITY OF LONDON.

Sir,

WHEN I considered of your great abilities, and most consummate knowledge, in things of this nature, I was under great hesitations, lest I should appear too presumptuous in dedicating such a trifle to your worship: But then, *Sir*, again considering, that your candour, and obliging condescension was equally as great; and also encouraged by favours formerly received, I have ventured to shelter this TREATISE OF ARITHMETIC under your great

name; and if it gain but your approbation, I shall not be ambitious of any other *Imprimatur*; but acquiesce with some assurance, that the book will meet with a favourable and kind reception in the world. In this impression, I have endeavoured to be as correct as possible, and have made large *Additions* and *Improvements* in the several *Rules*; which, with all humble submission, encourages me to hope may in part excuse for my presumption of troubling your worship once more; and remain, with all possible respect and deference,

Your Worship's

most Devoted,

and most Obedient,

humble Servant,

GEO. FISHER.

(V)
THE

PREFACE.

S Ometime before I attempted, or had any thoughts of compiling this book, a very good friend of mine, (Mr *Wilkins*, *Russia* merchant) desired me to draw him out some few notes of the shortest ways and methods of working some of the rules in *Arithmetic*; which when I set about, endeavouring to oblige my friend, I hit on several things, (not thought on by me before) which I hoped, if made public, might be of good service to the world.

If it be objected, That the books on this subject are too numerous already, I answer, That as many as there are extant, yet there are none so perfect, but there may be improvements made upon them; and if so, and that those improvements may be of any considerable use and benefit to mankind, why may they not be made public?

Arithmetic (saith Mr *Locke*, in his *Essay on human understanding*) is of such general Use and Service, in all the parts of life and business, that scarce any thing is to be done without it; and therefore I think there cannot be too many, or too good instructions for its attainment: And before either *Hodder's*, *Cocker's*, or *Ayre's* books appeared in the world, there were many excellent pieces of that science then extant; and yet their books came abroad, and found encouraging entertainment, and they themselves applause for their endeavours.

And if another improves as much upon them, as they did upon others before them, why may he not hope for some success and approbation? In short, if the book meets with encouragement but equal to the Author's care and endeavours, to make it the most useful of its kind, he will have reward enough.

As to the work, I have gone through *Numeration*, *Addition* (with several useful tables) *Subtraction*, *Multiplication*, and *Division*, with so much plainness and perspicuity, and in such familiar and pertinent terms, that the meanest capacity may understand and apply them properly.

In

In *Multiplication* I have been more copious than ordinary, that I might shew the excellent uses that may be made of that rule only, particularly in *money*; where by having the price of one thing, I have shewn how to find out the value of many things at that rate: So that if a person well understands the methods and intentions of the rules and directions therein laid down, (which are as easy as *addition of money*) if he makes no farther advances in *Arithmetic*, yet he shall be able to cast up most things that ordinarily occur in common business with elegance and expedition.

In *Division* I have shewn the two *Italian* ways of dividing; and also several *examples*, whereby a sum many times may be sooner (and in much fewer figures) worked at two divisions than at one: Likewise how sums of divers denominations, as of *pounds, shillings, and pence, &c.* may be divided into equal parts, without reducing them into the lowest name mentioned (as is generally the practice) and is done in half the time, and quarter of the figures us'd in the other way. Also by *Division* to find, having the value of many things, the price of one thing at that rate.

In *Reduction* I have shewn great variety of working, and divers ways of abbreviating the common method us'd in that rule; and how to bring *gross weight* into pounds without multiplying.

Next I shew the shortest and best methods of deducting *Tare* and *Tret*, &c.

In the *Rule of Three* I have been very full in explaining its nature and use; with two several methods of shortening most operations in that rule, as is clearly evinced by sundry examples therein.

From thence I pass to the *Rule of Three Inverse*, and exemplify it by variety of rules and examples: As also the *Double Rule of Three Direct* and *Inverse*; with the *Rule of Three*, compos'd of the five given numbers.

Then the several *Rules of Practice* are taught, with greater variety and improvements than in any one book of ARITHMETIC hitherto extant.

As also the *Rule of Company*, with a method of contracting the tedious way of working questions in that rule.

Likewise *Interest* at all rates, shewn in sundry examples variously wrought. With *Discount*, *Exchange*, *Profit* and *Loss*.

Then I treat of *Fractions* both *Vulgar*

and

and *Decimal*, working one with the other, in such a method as renders both easy to be understood: And in such familiar terms as explain their nature and use.

I have now with the utmost care, diligence and probity, endeavoured to make this piece of ARITHMETIC the most useful of its kind, (considering its bulk and value) that is at present extant: Here is nothing abstruse or mysterious, but all plain and easy; and nothing but what will bear an intelligible demonstration.

I have gone thro' the whole book, line by line, and have taken all due care to correct what was amiss in the other impression; and as there was no other hand in the revision made use of but my own, I can with greater assurance affirm, and with the more confidence assert, that the book is now entirely correct*: And the *additions*, which are very numerous and considerable, (almost in every rule) are new, short, and very concise in operation; and pertinently interspersed thro' the whole, as I had opportunity, and saw occasion.

* This is to be understood of a former edition, which the Author himself corrected; but many errors have slipped in since, in some latter *London* editions, which, with great care, and pains, have been corrected in this edition.

If

If there should by chance, be a transposition of a letter, (tho' there hath been great care taken of that also) or by a greater chance, a false figure, or cypher, or a misplaced one, I hope, nay, I doubt not, but truly judicious, and candidly ingenious readers will excuse me for them; for tho' all may take care, yet there's none infallible. But I can with a modest boldness assure them, there is no occasion for an *errata* page, which may discourage them at beginning, or cool them at the latter end of the book.

THE

THE CONTENTS.

CHAP. I. *Of Numeration, with various examples and methods of reading and writing numbers.*

II. *Addition of whole numbers, comprehending that of money, weight, measure, etc. with very useful and necessary tables to each rule.*

III. *Subtraction of whole numbers, in money, weight, and measure, with pertinent and familiar examples for the full and easier understanding its nature and use.*

IV. *Multiplication of whole numbers, with great variety in the several ways of working that rule; and also new methods to render it as useful in business, as if the learner understood the Rule of Three, and Practice.*

V. *Division of whole numbers, with new improvements, and how to make it answer many questions that seem to require the Rule of Three for their solution.*

VI. *Reduction of money, weight and measure, with sundry examples of improvement, and contracting several things in that rule; with a method of reducing gross weight into pounds, without Multiplication.*

VII. *Of Tare and Tret, &c. with great variety in deducting them in the general and particular way of business.*

VIII. *The Single Rule of Three Direct, with great improvements, and two methods of contracting most questions in that rule.*

IX. *The Single Rule of Three Inverse, explain'd, improv'd, and taught by sundry and various examples.*

X. *The Double Rule of Three Direct, with great variety; and how to work any question therein, by rule composed of the five given numbers.*

XI. The Double Rule of Three Inverse, *as also how to operate any question in that rule, by a rule of five numbers.*

XII. Rules of Practice, *with greater variety and brevity than is in any book extant.*

XIII. The Rule of Company, or Partnership, *with or without time; as also how to contract the tedious and common methods of working questions in that rule.*

XIV. Barter, *with the divers methods of exchanging one sort of goods for another.*

XV. Interest, *with several examples variously wrought, as also several other useful things worked by the same methods that do not come under the denomination of interest; as provision, avarage, &c.*

XVI. Discount, *with sundry examples and methods of operations.*

XVII. Exchange in various examples; *with tables of the several species of foreign money, and their English value, &c.*

XVIII. Profit and Loss, *with facile and concise methods of finding the gain or loss, on any commodity, either in the whole, or at so much per Cent.*

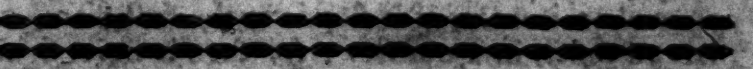
XIX. Fractions Vulgar and Decimal, *work'd together in such intelligible order, that the meanest capacity may understand the nature and use of both. Also, The Rule of Three in Fractions, Vulgar and Decimal, and some practical examples of Interest wrought decimally, &c.*

ARITHMETICK,

WITH

NEW IMPROVEMENTS,

In the plainest and most concise Methods
hitherto extant.



CHAP. I.

ARITHMETICK is the art of casting accounts by number, and hath these five parts, viz. NUMERATION, ADDITION, SUBTRACTION, MULTIPLICATION, and DIVISION, which ought thoroughly to be known and understood; for by these rules only, the whole art is attainable, all other being wrought by them.

B

of

OF NUMERATION.

NUMERATION teaches to read or write any sum or number known or proposed.

To which end observe, That all numbers whatsoever, are express'd by, or composed of these ten figures or characters, *viz.*

One,	Two,	Three,	Four,	Five,	Six,
1	2	3	4	5	6
	Seven,	Eight,	Nine,	Cypher.	
	7	8	9	0	

The first nine of these are called significant figures, to distinguish them from the 0, or Cypher, which of itself, is insignificant, and therefore, by some, is called a Nought; but it serveth to increase or decrease the value of other figures, according as it is placed.

Every one of the nine digits hath two values; the one certain by its form; the other uncertain by its place.

The value of a figure may be said to be certain, when it stands alone, without any figure or cypher annexed to it: Or, if it stands in the first place, or place of units, in a number; for then it never signifies any more than its own simple value; as 2 is but two, 6 but six.

The value of a figure may be said to be uncertain, with respect to the place it is found in: So any of the nine figures in the place of units, signifies but its simple value, (as was said before) but in the second place it is to be accounted so many tens, as it contains units. As 5, in the first place, is but five; but in the second place it signifies so many tens, or fifty. So that 5 may signify five, or fifty, or five hundred, or five thousand; and 7 may signify seven, or seventy, or seven hundred thousand, &c.

So

So every figure is encreased in value, by a tenfold proportion, from the right hand to the left. As, in the first place, it is so many units, or ones; in the second place, so many tens; in the third place, so many hundreds; in the fourth, so many thousands; in the fifth, so many ten thousands; in the sixth, so many hundred thousands; in the seventh, so many millions, &c.

Admit this number for explanation, *viz.* 1234567, the seven is only seven units, or seven; but six in the second place, is six times ten, or sixty; the 5 in the third place, an hundred times five, or five hundred; the 4 in the fourth place, a thousand times four, or four thousand; the 3, three times ten thousand, or thirty thousand; the 2, in the sixth place, two hundred thousand; and 1, in the seventh place, one million. Thus the order of places is accounted from the right hand to the left, but to be read from the left hand to the right, thus; one million, two hundred, thirty-four thousand, five hundred, sixty-seven.

If any figure hath a cypher, or cyphers, joined to it, it will still retain the value of its place, as much as if joined with any other figure, or figures, in the room of the cypher, or cyphers. So if to the figure 5, there be annexed a cypher thus (50) its value is five tens, or fifty; because it stands in the second place, or place of tens. Or, if it have two cyphers joined with it thus, (500) its value is five hundred; because it possesseth the place of hundreds, or third place, &c.

For the easier understanding the foregoing directions, and better reading any number, observe the following *T A B L E*.

The NUMERATION TABLE.

Places.	Hundreds of Millions.	Ten of Millions.	Millions.	Hundreds of Thousands.	Tens of Thousands.	Thousands.	Hundreds.	Tens.	Units.	Mill.	Thous.	Units.
	9	8	7	6	5	4	3	2	1	987	654	321
		9	8	7	6	5	4	3	2	98	765	432
			9	8	7	6	5	4	3	9	876	543
				9	8	7	6	5	4		987	654
					9	8	7	6	5		98	765
						9	8	7	6		9	876
							9	8	7			987
								9	8			98
									9			9

The first thing to be done, is to get by heart the value of the several places, with their numbers, at the head of the Table, viz. Units, Tens, Hundreds, Thousands, &c. which being well understood, the learner may thereby be capable of reading or writing any number proposed.

And for the easier reading of the numbers in the table, they are, on the right hand, set by periods; and over them the names of Units, Thousands, and Millions, and to be read thus; 987 Millions, 654 Thousands, 321. The next line, 98 Millions, 765 Thousands, 432. And the next, 9 Millions, 876 Thousands, 543, &c.

Though

Though this table consists of but nine places, yet it might have been extended to twelve, fourteen, or more places at pleasure. As after hundreds of millions, thousands of millions, ten thousands of millions, hundred thousand of millions; then millions of millions, &c.

As, admit of this number of thirteen places. viz. 1234567890123; for the easier reading of which, or any other number, make a point under or over every third figure, beginning at the right hand thus.

1 234 567 890 123

So that the first point is under 1, and the last under 2, towards the left hand; and you are to account every third place, or periods, hundreds, and to read it thus; 1 Million of Millions, 234 Thousands, 567 Millions, 890 Thousands, 123.

QUESTIONS.

1. What is 5 in the fifth place?

Answ. By annexing four Cyphers on the right hand thus, 50000; it is fifty thousand.

2. What is 7 in the seventh place?

Answ. By putting six Cyphers on the right hand thus, 7000000; it is seven millions.

3. How do you set down eleven thousand, eleven hundred and eleven?

Answ. Thus, 12111, { 11000, Eleven Thousand.
1100, Eleven Hundred.
11, Eleven.

Proved by Addition. 12111. Proof.

4. How do you write fourteen thousand, fourteen hundred, and fourteen?

B 3

Answ.

Anfw. Thus 15414, $\left\{ \begin{array}{l} 14000, \text{Fourteen Thousand} \\ 1400, \text{Fourteen Hundred} \\ 14, \text{Fourteen.} \end{array} \right.$

Proved by Addition, 15414. *Proof.*

NUMBERS.

707, Seven Hundred and Seven,
 4006, Four Thousands and Six.
 60606, Sixty Thousands, Six Hund. and Six.
 100004, One Hundred Thousand and Four.
 7770405, Seven Millions, 770 Thousands 405
 500007, Five Hundred Thousand, and Seven.
 111111, One Hundred and 11 Thousand, 11
 999999, A Million wanting One.
 400400400, Four Hund. Millions 400 Thousf. 400
 100000000, $\left\{ \begin{array}{l} \text{Ten Thousf. Times Ten Thousf.} \\ \text{or, One Hundred Millions, } Rev. v. \\ 11. \end{array} \right.$
 200000000, $\left\{ \begin{array}{l} \text{Two Hundred Thousand Thousf.} \\ \text{or Two Hundred Millions, } Rev. ix. \\ 16. \end{array} \right.$
 2070040500, $\left\{ \begin{array}{l} \text{Two Thousf. and Seventy Million} \\ \text{Forty Thousand Five Hundred.} \end{array} \right.$

A Table of Old Roman Numbers.

100 C.	2000 CĬ. CĬ. or M. M.
200 CC.	3000 CĬ. CĬ. CĬ. or M. M. M.
300 CCC.	5000 IĬ.
400 CCCC.	10000 CCĬ.
500 D or Ĭ.	50000 IĬ.
600 DC.	100000 GCCĬ. or CM.
700 DCC.	500000 IĬ.
800 DCCC.	1000000 CCCCĬ.
900 DCCCC.	1666 MDCLXVI.
1000 M. or, CĬ.	1718 MDCCXVIII. or, CĬ.
	IĬCCXVIII.

Chap. I.
housand.
undred.

Chap. II.

OF ADDITION.

7

CHAP. II. OF ADDITION.

ADDITION is the putting two or more numbers or sums together, and thereby bringing them into one total sum.

and Six.

Four.

ds 405.

Seven.

nd, 111.

ousf. 400.

housand

Rev. v.

Thousf.

Rev. ix.

Millions,

red.

And is of one denomination, or several.

Addition of one denomination is, when the numbers or several articles are all of one name; that is, all pounds, gallons, ells, miles, sheep, &c.

Addition of several denominations is, when the several lines consist of divers names, as pounds, shillings, and pence; hundreds, quarters, and pounds; yards, quarters, and nails, etc.

Numbers to be added together, must be placed in each order under one another, (it matters not which uppermost, the greatest or least numbers) that units may stand under units; tens under tens; hundreds under hundreds; thousands under thousands. &c.

As if you were to add 120 feet, 44 feet, and 34 feet together, they must be set down one under the other as follows, viz.

<i>Feet.</i>		<i>Feet.</i>
120	Or thus,	34
44		44
34		120

10.

H A P.

Having placed the numbers to be added as above draw a line under them, and begin at the lowest figure on the right hand, being the place of units, 4 and 4 is 8, which put directly under the 4, and just under its own rank, viz. under 4 and 0; and then go to the next row towards the left

left-hand, saying, 3 and 4 is 7, and 2 is 9; which also set down under the line, just under its own proper rank, viz. under 3, 4, and 2; then go to the last row, where you find but 1, which you must put down also under the line just under itself; and so the numbers are added together; and you will find that they make 198 feet in all, as by the *Example* following.

<i>Hundreds.</i>	<i>Tens.</i>	<i>Units.</i>
1	2	0
	4	4
	3	4
1	9	8

<i>Hundreds.</i>	<i>Tens.</i>	<i>Units.</i>
	3	4
	4	4
1	2	0
1	9	8

Feet in all.

When any of the ranks amount to ten or tens or they exceed ten or tens, then you must place a cypher under the line in its proper place; or else what is above ten, or tens; and for every ten carry a unit, or one, to be added to the next rank. *For Example:* If the series or row, amount just to ten, I set down a cypher under the line in its place (for every figure or cypher must be sure to stand just under its own rank) and carry one to the next rank for the one ten. So if any of the rows come just to even tens, as 20, 30, 40, &c. I set down a cypher, and carry either two, three, or four, according to the number of tens. And when it happens, that any of the ranks exceed ten, or tens, then whatever the excess is, set it down under the line in its place. As if it amounts to 45, set down 5, and carry 4, for the four tens, to the next row. If to 72 set down 2, and carry 7, for the seven tens, &c. And when you come to the last row, set down what is amount

amounts to, let it be what it will. *Examples* follow, simplifying the directions above.

Add 26*l.* 15*l.* 20*l.* and 45*l.* together. Also 265 Ells, 354 Ells, 460 Ells, 375 Ells, and 246 Ells together ; which must be set down as underneath.

<i>Pounds.</i>	<i>Ells.</i>
26	265
15	354
20	460
45	375
	246
106	1700

Beginning at the lowermost figure in the place of units, say, 5 and 5 is 10, and 6 is 16, which is 6 over the ten, wherefore set down 6 under its own rank, and carry 1, for the ten, to the next rank, saying, 1 that you carry, and 4 is 5, and 2 is 7, and 1 is 8, and 10, which being the last row set down 10, and the work is done ; and the *Total* of the four numbers 106*l.* As in the *Example*.

Now, in the next *Example*, begin with the bottom figure on the right hand, and say, 6 and 5 is 11, and 15, and 5 is 20 ; which being just 2 tens, and nothing over, set down a 0, and carry 2 to the next rank, for the 2 tens, and say, 2 that you carry, and 6, and 7 is 13, and 6 is 19, and 5 is 24, and 6 is 30, which amounting just to 3 tens, set down a 0 again, and carry 3 for the 3 tens, saying, 3 that you carry, and 7, and 2 is 5, and 3 is 8, and 4 is 12, and 3 is 15, and 2 is 17, which being the last row, set down 17, the total sum is 1700 ells ; as may be seen in the *Example*.

The reason for carrying one for every ten to the next rank is, because the increase of every place that is by a ten-fold proportion, as was said in *Numeration*.

Examples

Examples for Practice.

<i>Yards.</i>	<i>Gallons.</i>	<i>Pounds.</i>
74	74	746
09	9	379
72	72	024
19	19	100
07	7	074
70	70	047
251	251	1370

Some choose to omit the cyphers on the left hand as in the second *Example*; thinking it a little too precise, since cyphers on the left hand signify nothing but the other is best for a learner, for his better understanding the value of the places, &c.

More Examples.

<i>l.</i>	<i>Ells.</i>	<i>l.</i>
71	742	7444
17	371	270
46	462	5000
64	072	500
20	971	6742
2	674	240
56	321	52
65	015	9
341	3628	20257

Here follow some familiar *Examples*, shewing nature and use of this rule, viz.

Quest

Question 1. Between *London* and *Roxton* are 33 miles; from thence to *Cambridge* 10; thence to *Newmarket* 10; thence to *Bury* 10; thence to *Thetford* 10; thence to *Attleborough* 10; and from thence to *Norwich* 12 miles: How many miles are there between *London* and *Norwich*?

Miles.

33
10
10
10
10
10
12

Set the numbers down thus :

Between *London* and *Norwich* are 95 miles.

Question 2. Again, how many days are there in the 12 Calendar Months, or a Year?

Days.

January hath _____ 31
February _____ 28
March _____ 31
April _____ 30
May _____ 31
June _____ 30
July _____ 31
August _____ 31
September _____ 30
October _____ 31
November _____ 30
December _____ 31

Answer, 365 days.

Question 3. Suppose a farm contains these acres in several fields following, viz.

	<i>Acres.</i>
In one Field _____	10
Another _____	15
Another _____	12
Another _____	20
Another _____	9
Another _____	6
And in another _____	22

How many Acres in all? 94 Answer.

Question 4. Admit a Draper measures 10 pieces of cloth, and their contents are, viz.

No.	<i>Yards.</i>
1 qt. _____	35
2 _____	12
3 _____	25
4 _____	10
5 _____	9
6 _____	16
7 _____	10
8 _____	20
9 _____	15
10 _____	8

How many yards in all?

Answer, 160 Yards.

Note, That in setting down the numbers, care must be taken, not to place units under the place of tens, but to put them properly, as in the 5th and last article of the sum above.

Quest

Question 5. A Corn-Factor bought as follows, viz.

	<i>qrs.</i>
<i>Wheat</i> _____	56
<i>Oats</i> _____	45
<i>Peas</i> _____	24
<i>Rye</i> _____	72
<i>Barley</i> _____	220
	417 quarters in all.

Question 6. A ship from the Indies, whose cargo as follows, viz.

	<i>l.</i>
<i>Pepper</i> _____	14280
<i>Other Spices</i> _____	9741
<i>Diamonds</i> _____	112579
<i>Callicoes</i> _____	47217
<i>Muslins</i> _____	74219
<i>Drugs</i> _____	11241

What is the value of the whole? *l.* 269277 *Answ.*

Question 7. What number is that, from which if you subtract 18, the remainder will be 24?

Answ. 42. For if you add 18 and 24 together, they make 42 the number sought.

To prove A D D I T I O N.

Begin at the top, and cast it downwards, in the same manner as you did upwards; and if the figures, cyphers of the total, prove the same as in casting upwards, the work is right; otherwise they must be cast upwards and downwards, till they do agree.

C

A D-

ADDITION of MONEY.

In *Addition* of several denominations must be observed, how many of the *smaller* name make one of the next greater: As how many *farthings* make a *penny*; how many *pence* a *shilling*; and how many *shillings* a *pound*. Wherefore I shall place the several *Tables of Money, Weight, Measure*, etc. before the *examples*, they being necessary to be first known.

Note, 4 *farthings* make one *penny*, 12 *pence* one *shilling*, and 20 *shillings* one *pound*.

In a pound Sterling, are $\left\{ \begin{array}{l} 20 \text{ Shillings.} \\ 240 \text{ Pence.} \\ 960 \text{ Farthings.} \end{array} \right.$

Note also, That in addition of *English money*, l. stands for *Pounds*; s. for *Shillings*; d. for *Pence*; gr. for *Farthings*; because *Libra* signifies a *Pound*; *Solidus* a *Shilling*; *Denarius* a *Penny*; and *Quadrans* a *Farthing*.

But the best way to set down *Farthings*, or parts of a *Penny*, is :

$\frac{1}{4}$ { A *Farthing*, or quarter of a *Penny*.
 $\frac{1}{2}$ { A *Half-penny*, Half a *penny*.
 $\frac{3}{4}$ { Three *Farthings*, Three quarters of *Penny*.

Example 1.

Suppose I owe one person, 5l. 4s. 6d. to another 7. 11. 9. to another, 4. 07. 5. to another, 7. 08. 4. to another, 8. 00. 0. and to another, 9. 07. 6. How much do I owe in all to these several persons? To do this, these several sums must be set down in such order, that pounds may stand under pounds, shillings under shillings, and pence under pence; with points or strokes of separation between them, as follows.

<i>l.</i>	<i>s.</i>	<i>d.</i>
5	04	6
7	11	9
4	07	5
7	08	4
8	00	0
9	07	6

In casting up this and all other sums in this rule, you must remember, That for every 4 in the *farthings*, you must carry 1 to the pence, because four farthings make a penny; for every 12 in the pence, you must carry 1 to the shillings, because 12 pence make a shilling; and for every 20 in the shillings, you must carry 1 to the pounds, because 20 shillings make a pound; and the pounds must be cast up as sums of one denomination, for every 10, carrying 1 to the next row. And in all additions, whether of *Money*, *Weight*, or *Measure*, &c. that denomination towards the left hand (which is the first in setting down, but the last in casting up) must be so cast up.

The same being again set down with a line drawn under it, appears thus :

<i>l.</i>	<i>s.</i>	<i>d.</i>
5	04	6
7	11	9
4	07	5
7	08	4
8	00	0
9	07	6

41 19 6

I begin at the smallest denomination towards the right hand, (as in all *Additions* we must, whether of *Money*, *Weight*, or *Measure*) to wit, *Pence*, and say, 6 and 4 is 10, and 5 is 15, and 9 is 24, and 6 is 30, now 30 pence is 2 shillings and 6 pence, wherefore, put down the 6 pence under its own rank, and car-

ry 2 for the two shillings to the rank of shillings, saying, 2 that I carry, and 7 is 9, and 8 is 17, and 7 is 24, and 11 is 35, and 4 is 39: Now, 39 shillings is 1 pound 19 shillings; wherefore I set down the 19s. under its own rank, and carry the one pound to the pounds, saying, 1 that I carry, and 9 is 10, and 8 is 18, and 7 is 25, and 4 is 29, and 7 is 36, and 5 is 41; which being placed under the title of pounds, is forty-one pounds: so the whole sum is, 41 *l.* 19s. 6d. as in the example may be seen.

Addition of several denominations, is proved in the same manner as *addition* of one, by casting it downwards; and if it agrees with the sum when cast upwards, it is right.

There is another way used in schools; that is, to cast up all again, except the upper line, and then that total they add to the upper line, and if it agree with the sum first found, it is right. But this way is not so practical in matters of real business; therefore I prefer the other before it.

For the readier dispatch in casting up the pence, 'tis very necessary to have the following tables by heart.

Pence.	s.	d.		Pence.
20	1	8	Or, 12 Times	12
30	2	6		24
40	3	4		36
50	4	2		48
60	5	0		60
70	5	10		72
80	6	8		84
90	7	6		96
100	8	4		108
110	9	2		120
120	10	0		144

Get these Tables by heart, thus; 20d. is 1s. 8d.
30d. is 2s. 6d. &c.

Example

Example 2.

Bought by a country *Shop-keeper* in *London*, viz.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
<i>Linnen Cloth</i> , to the value of — —	21	11	4
<i>Sugars</i> , — — — — —	7	10	0
<i>Tobacco's</i> — — — — —	16	14	2
<i>Woollen Cloths, and Stuffs</i> , — — —	37	10	0
<i>Fruit</i> , — — — — —	11	16	8
<i>Brandy, and Waters</i> , — — — — —	9	14	2
	104	16	4

How much did he lay out in all?

Beginning at the pence, I say, 2 and 8 is 10, and 2 is 12, and 4 is 16; and 16*d.* is 1*s.* 4*d.* I set down the 4, and carry the shilling to the next, the place of shillings, saying, 1 that I carry, and 4 is 5, (for I omit the tens of shillings till I come to the top) and 6 is 11, and 4 is 15, and 1 is 16; then I come downwards with the tens, saying, 16 and 10 is 26, and 10 is 36, and 10 is 46, and 10 is 56, and 10 is 66, and 10 is 76 shillings, which is 3*l.* 16*s.* I set down the 6 under the place of shillings, and carry the 3 pound to the pounds, saying, 3 and 9 is 12, and 1 is 13, (for I go up but with one row at a time) and 7 is 20, and 1 is 26, and 7 is 33, and 1 is 34; I set down 4, and carry 3 for the 3 tens (for the last denomination must be cast up as sums of one denomination, for every time carrying 1, as was said before) and say, 3 that I carry, and 1 is 4, and 3 is 7, and 1 is 8, and 2 is 10; which being the last row, I set it down. So the whole sum is, 104*l.* 16*s.* 4*d.* as per the work.

Example 3.

A Merchant upon the ballancing of his books, finds he has in money, debts and goods, viz.

	l.	s.	d.
In Cash, — — — — —	2000	00	0
In Gambries, — — — — —	60	00	0
In Tobacco's, — — — — —	47	16	6
By Henry Harper, owing, — — —	121	17	4
In Sugar, — — — — —	246	07	2
In Serges, — — — — —	70	11	0
By voyage to Lisbon, — — — —	724	06	7
In Indigo, — — — — —	370	12	0
By William Waxham, — — — —	1000	00	0
In Cochineal — — — — —	424	16	8
By the Ship Rose — — — — —	640	11	0
In Canary Wine, — — — — —	142	17	0
Total,	5849	15	3

Example 4.

A Brewer's Clerk receives of several persons as follows, viz.

	l.	s.	d.
Of { Laurence Lick-Spiggot, — — —	12	14	0
Frank Froth — — — — —	9	10	0
Sam. Swigg, — — — — —	20	11	0
Ben. Bumper, — — — — —	36	16	0
Henry Here's t'ye, — — — —	24	00	0
Stephen Stout, — — — — —	8	16	0
Receiv'd in all,	112	09	0

Example

Example 5.

nds A Collector of *Excise* receives in

					l.	s.	d.
d.	Suffex,	—	—	—	1420	10	6
0	Kent,	—	—	—	0974	11	2
0	Surry,	—	—	—	0641	17	4
6	Hampshire,	—	—	—	1344	11	1
4	Hertfordshire,	—	—	—	0741	17	4
2	Bucks,	—	—	—	0617	10	0
0							
7					Total,	5740	17 5

Example 6.

Sold by a *Hosier*.

Sold by a <i>Hofier</i> ,		<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>
4 <i>pr.</i>	Silk Stockings, at	—	2	10	6
7 <i>pr.</i>	Worsted <i>ditto</i> , at	—	1	18	2
9 <i>pr.</i>	of Thread Hose, at	—	0	18	—
12 <i>pr.</i>	of Childrens, at	—	2	07	0
3 <i>Yds.</i>	of Flannel, at	—	0	02	7
6 <i>pr.</i>	of mill'd Hose, at	—	1	04	6
In all,			8	18	9

Here I begin with the farthings, saying, 3 and 1 is 4, and 2 is 6, and 3 is 9, and 1 is 10, and 2 is 12, which is three-pence, which I carry to the pence, &c.

Sometimes fums are *expressed* one way, and *set down* another, viz.

Example

Example 7.

		<i>Expressed</i>	<i>Set down</i>		
			<i>l.</i>	<i>s.</i>	<i>d.</i>
For	{	<i>Coals, Six and Thirty Shillings,</i>	1	16	0
	{	<i>Cloth, Seven and Fifty Shillings,</i>	2	17	0
<i>Sum,</i>			4	13	0

Example 8.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
A Guinea, —	1	01	0
A Mark, — —	0	13	4
An Angel, —	0	10	0
A Noble, — —	0	06	8
A Crown, —	0	05	0
A Half-Crown, —	0	02	6
Total,	2	18	6

Example 9.

			<i>Express'd</i>		<i>Set down</i>	
					<i>s.</i>	<i>d.</i>
Mutton, Eight Groats	—	—			2	8
Onions, Seven Farthings,	—				0	1 $\frac{1}{4}$
Tobacco, Two and Twenty-pence,	—				1	10
Wine, Fifteen Pence,	—	—			1	3
Thread, Three Half-pence,	—				0	1 $\frac{1}{2}$
Soap, Nineteen Pence,	—				1	7
Veal, Eleven Groats, and Two Pence,					3	10
						Sum, 11 5 $\frac{1}{4}$

Tho

Tho' when some of these sums are to stand alone, not in order of pounds, shillings and pence; as Letter, &c. 'tis better to set them down as spoken: As 15*d.* 45*s.* etc. rather than 1*s.* 3*d.* or 2*l.* 5*s.*

Note, That in setting down your sums, care must be taken, that you do not set down more, or so much in the place of a lesser denomination, than makes one the next greater: for it would be absurd to write 18*l.* 22*s.* 15*d.* for 19*l.* 03*s.* 3*d.* Or, 15*G.* 29*lb.* for 16*G.* 0*q.* 1*lb.*

Some used formerly (and some of weak heads do now) to make a *point* or *stop*, at every 4 in the farthings; at every 12 in the pence; at every 20 in the shillings; and at every 10 in the pounds; if they consist of several ranks, carrying so many ones, as they find points or specks in one denomination, to the next: but this way is both tedious and slovenly. If your sums are very large, you may make a stop at every 60, in the pence, for 5*s.* and carry accordingly to the shillings; and for the units rank in shillings, cast them up as sums of one denomination every ten carrying one to the tens of shillings, and reckon them as so many ones; and when you come to the top, halve them, which half carry to the pounds; but if they halve not even, set down the odd one, in the ten's place of shillings, &c. Examples which you will find in the following page.

Whenever there is a necessity to *point* or *stop*, do rather upon your nail, or on a bit of paper, than your book, or paper where the sum is; because, proving it, the points very rarely happen in the same place; and the many *stops* may be apt to confound you, and also make the work appear foul.

Example

Example 10.

<i>l.</i>	<i>s.</i>	<i>d.</i>
16	17*	10
47	11	6.
74	06	09
54	19	7
45	09	8
72	14	5
27	04	3
16	07*	9
61	17	8
24	06	7.
42	17	5
24	19	7
47	11	5
74	01	9
41	00	7
36	17	5
47	17	9
20	10	11
777	12	10

Example 11.

<i>l.</i>	<i>s.</i>	<i>d.</i>
714	19	6
412	10	7
374	11	9
241	14	5
474	16	4
372	12	6
330	12	9
200	07*	9.
472	12	7
521	09	6
245	17	8
324	12	2
725	15	4
317	13	9
972	14	5
321	15	7
733	17	3
245	11	1
8004	04	11

Here, in the 10th example, I begin at the bottom saying thus, 11 and 9 is 20, &c. till I come to the article 24*l.* 6*s.* 7*d.* where the figures amount to 6 there I make a *point* or *stop*, for 5*s.* and carry 5 to the next figure over it, saying, 5 and 8 is 13, &c. till I come to the article 47*l.* 11*s.* 6*d.* where it amounts to just 60; and there I make another point for 5*s.* more; and for the odd 10*d.* I set it down in its place, and carry the two 5*s.* making 10, to the shillings, saying, 10 and 7 is 17, and 7 is 24, &c. till I come to the top, there it amounts to 102; wherefore I set down 2, and carry 10 to the tens of shillings

saying, 10 and 1 is 11, &c. And at the top comes to 21, the half of which is 10, and 1 over, which I place on the left hand of the 2, and it makes 25. and I carry the 10 to the pounds, saying, 10 and 1 is 17, and 6 is 23, &c. casting the pounds up as sums of one denomination; and the total is 777 l. 25. 10d. As in the *example* may be seen.

Or the *shillings* may be cast up by *pointing* at every 10, and 40, in the unit rank of *shillings*, which make 1. As at the articles, l. 16-07 9* and l. 16-17 10* the uppermost number, where a small *Asterism* is placed, to denote it accordingly. At the top it comes 42: I set down 2, and carry 5l. to the tens of *shillings*, taking two of them as I go up, for 1l. saying, 5 I carry, and 1 is 6. and 1 is 7, &c.

AVOIRDDUPOIS-WEIGHT.

By this weight is weighed all kind of *Grocery* wares; goods subject to waste; as *Tobacco, Sugar, Fruit, Drugs, Butter, Cheese, Allom, Iron, Brass, Lead, Soap, Tallow, Pitch, Rozin, Tin, Salt, Wax, Flax, Hemp,* and all kind of *Garble Goods, &c.*

A Table of Avoirdupois Weight.

16 Drams	}	make	1 Ounce	}	oz.
16 Ounces			1 Pound		lb.
28 Pounds			1 Quarter of a Hundred		qr.
4 Quarters	}		1 Hundred	}	C.
20 Hundred			1 Tun.		T.

Note, A Pound Avoirdupois Weight is equal to 14 Ounces, 12 Penny Weight, Troy.

In

In a Tun weight, are, { 573440 *Drams.*
 35840 *Ounces.*
 2240 *Pounds.*
 80 *Quarters.*
 20 *Hund.* weight of 112 lb. each

AVOIRDUPOIS *Great Weight.*

Examples.

(10)	(20)	(4)	(28)	(10)	(10)	(4)	(28)
<i>Tuns.</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>	<i>Tuns.</i>	<i>C.</i>	<i>qr.</i>	<i>lb.</i>
7	14	3	12	7	11	1	12
5	19	1	06	6	07	2	15
9	07	1	00	7	09	1	17
7	07	2	12	4	15	1	06
2	15	0	20	6	07	1	14
9	17	3	21	2	17	0	19
43	02	0	15	35	08	0	27

Here you must begin at the least denomination towards the right hand (as before in money;) viz Pounds; saying, 21 and 10 is 31, (taking but one 10 in the 20, for the easier reckoning) which is 3 above 28; make a point on your nail for the quarter, and say, 3 and 10 that was left in the 20, is 13, and 12 is 25, and 6 is 31; make another point, and say 3 and 12 is 15, which set down under its own rank and for the two points, or stops, made for the quarters, carry 2 to the quarters, saying, 2 and 3 is 5, and 2 is 7, and 1 is 8, and 1 is 9, and 3 is 12. Now 12 quarters is just 3C. wherefore set down 0, and carry 3 to the Hundreds; and proceed as in *Money*

(200)

Twelve Hogheads of Tobacco, containing, viz.

No	C.	qr.	lb.
1	7	3	12
2	4	1	17
3	9	0	24
4	6	3	26
5	5	1	17
6	4	2	20
38	2	04	

No	C.	qr.	lb.	Tare.
7	5	1	24	90
8	4	2	19	94
9	4	3	23	99
10	3	3	21	84
11	4	1	23	79
12	4	3	24	96
28	1	22	542	

C.	qr.	lb.
71	1	19
47	3	24
57	2	16
71	0	21
47	1	12
51	2	06
347	0	14

C.	qr.	lb.
46	1	19
24	3	03
23	0	21
67	2	13
27	1	17
34	3	23
224	1	12

Avoirdupois Small Weight.

This is in use chiefly for *Silk*; as among *Stocking-makers*, *Weavers*, etc. they deliver their *Silk*, out and in, by *Pounds*, *Ounces*, and *Drams*.

Examples.

Examples

(16)		(16)
lb.	oz.	dr.
4	10	06
7	14	12
5	07	04
9	14	15
4	05	07
6	11	14
39	00	10

(16)		(16)
lb.	oz.	dr.
4	11	14
2	13	12
7	10	15
4	07	14
6	09	06
4	07	10
30	13	07

But in weighing Worsted, and some other Things, 'tis usual to go no lower than a quarter of an Ounce; as in these Examples.

(16)		(4)
lb.	oz.	gr.
4	13	1
7	12	2
9	11	3
7	04	2
4	13	1
34	07	1

(16)		(4)
lb.	oz.	gr.
9	07	2
7	10	1
8	15	3
7	12	2
3	13	3
37	11	3

Wool is also weighed by *Avoirdupois* weight, but differently divided, according to the following table, viz.

OF ADDITION.

Chap. II

Note, that	{	7 Pounds is one Clove,	}	or,	{	lb.
		2 Cloves, one Stone,				14
		2 Stone, one Tod,				28
		6 $\frac{1}{2}$ Tod, one Wey,				182
		2 Weys, one Sack,				364
		12 Sacks, one Last.				4368

And in a *Last of Wool*, are {

4368 Pounds,
624 Cloves,
312 Stone,
156 Tod,
24 Weys,
12 Sacks.

Note, That the Wey differs in some counties; as in *Suffolk*, the Wey is 336lb. or 42 Cloves; in *Essex* 256, or 32 Cloves; and according to the division above, 182lb.

TROY WEIGHT.

By this weight are weighed *Jewels, Gold, Silver, Pearl, Electuaries, and Liquors*. A pint of *Water, Wine*, etc. being a pound. And the usual denominations are *Pounds, Ounces, Penny-Weights, and Grains*, as in the following table.

Note, {

24 Grains
20 Penny-weight
12 Ounces

} make {

1 Penny-weight.
1 Ounce.
1 Pound.

In a Pound of Troy, are {

5760 Grains.
240 Penny-Weight.
12 Ounces.

25lb. 1 Quarter of a Hundred,
100lb. 1 Hundred Weight.
20 Hundred, 1 Tun of gold or silver.

The

The value of Gold.

The value of Silver.

l. s. d.
Pound wt. is worth 48-00-0
Ounce — — 4-00-0
Penny-Weight, 0-04-0
Grain, — 0-00-2

l. s. d.
1 Pound wt. 3-00-0
1 Ounce, 0-05-2
1 Penny-wt. 0-00-3 $\frac{1}{8}$
1 Grain, $\frac{1}{2}$ a Farthing.

A Tun of Gold at 4*l.* the Ounce, *l.* 96000.

A Tun of Silver at 5*s.* the Ounce, *l.* 6000.

Examples of Troy-weight.

	(12)	(20)	(24)
<i>l. oz. dwt. gr.</i>			
4	10	12	20
5	04	06	13
7	07	07	06
5	04	19	14
4	11	04	14
6	04	17	21
34	07	08	16

	(12)	(20)	(24)
<i>l. oz. dwt. gr.</i>			
5	10	10	11
4	11	17	19
6	10	01	10
5	06	14	15
4	10	14	17
2	05	04	04
30	07	03	04

	(10)	(20)	(24)
<i>oz. dwt. gr.</i>			
24	13	10	
19	11	15	
07	04	14	
21	13	16	
11	05	23	
08	04	12	
14	07	10	
15	10	11	
122	11	15	

	(10)	(20)	(24)
<i>oz. dwt. gr.</i>			
105	10	05	
217	06	08	
360	03	06	
195	11	07	
217	02	09	
196	02	08	
321	07	05	
172	08	11	
1785	11	11	

Here is no occasion for pointing, but only in the grains: But if you do stop at more, only mind the figures over the titles, as before in *Avoirdupois weight* and they direct at what to point.

Note, A pound *Troy* is about 13 ounces, 2 dram and a half *Avoirdupois*; or as 17 to 14: And the ounce *Troy*, as 51 to 56.

A pound <i>Troy</i> of Gold	} is worth	l. s. d.
A pound <i>Avoirdupois</i> of Gold		48-0-0
		58-8-0

A pound <i>Troy</i> of Silver	} is worth	l. s. d.
A pound <i>Avoirdupois</i> of Silver		3-03-0
		3-15-3

	lb. oz.	
100l. in Gold, weighs	} 1-11 $\frac{3}{4}$	{ <i>Avoirdupois</i> .
100l. in Silver, weighs		

A pound *Avoirdupois* is heavier than a pound *Troy* but the ounce *Avoirdupois* is lighter than the ounce *Troy*; for the ounce *Troy* weighs 480 grains, but the ounce *Avoirdupois* but 438 grains.

APOTHECARIES WEIGHT.

Apothecaries have their weight deduced from *Troy* their pound being the same, to wit, 12 ounces; but differently divided, as follows, viz.

20 Grains	} make	1 Scruple	} 3	
3 Scruples		1 Dram		3
8 Drams		1 Ounce		3
12 Ounces		1 Pound		lb

By these weights *Apothecaries* compound their medicines; but they buy and sell their drugs by *Avoirdupois weight*.

Example

Examples.

(12) (8) (3) (20)					(10) (12) (8) (3) (20)				
lb	3	3	9	gr.	lb	3	3	9	gr.
4	10	7	2	19	48	07	1	1	17
3	10	6	1	10	12	11	4	2	12
2	09	5	0	06	24	06	7	1	07
1	08	4	2	04	19	10	5	2	12
1	06	3	1	12	34	07	6	0	00
1	00	0	0	00	24	04	4	1	15
15	10	3	2	11	165	00	6	1	03

In a Pound are { 5760 Grains
288 Scruples
96 Drams
12 Ounces

CLOTH MEASURE.

Note that { 4 Nails
4 Quarters
5 Quarters
3 Quarters } make { 1 Quarter
1 Yard
1 Ell Engl.
1 Ell Flem.

grs. N.
3 } or { 12
4 } { 16
5 } { 20
6 } { 24 } make { 1 Ell Flemish
1 Yard
1 Ell English
1 French Aune or Ell.

Examples.

Examples.

(10)(4)(4) Yds. qrs. Nls.	(10)(5)(4) El. Eng. qrs. Nls.	(10)(3)(4) El. Fl. qrs. Nls.
14 1 3	24 3 3	25 2 3
21 2 2	17 4 1	36 1 2
56 1 0	46 2 2	42 2 3
42 2 3	27 1 0	54 2 1
17 0 1	34 4 3	61 1 2
24 1 2	51 2 2	72 2 3
176 1 3	202 3 3	294 1 2

LIQUID MEASURE

Is of two sorts; one for *Wine, Spirits, Oil*, etc. And the other for *Ale and Beer*. The tables of which are as follows.

In WINE MEASURE.

231 Solid inches,	} make	1 Gallon.
42 Gallons,		1 Tierce.
63 Gallons, or 1 Tierce & $\frac{1}{2}$		1 Hoghead.
2 Hogheads		1 Pipe, or Butt.
2 Pipes, or Butts,		1 Tun.
84 Gallons,		1 Puncheon.

By this measure all Wines, Brandies, Spirits, Strong Waters, Cyder, Perry, Mead, Oil and Honey are sold.

In a Tun are	2016 Pints.
	1008 Quarts.
	252 Gallons.
	14 Rundlets.
	6 Tierces.
	3 Puncheons.
	4 Hogheads.
	2 Pipes, or Butts.

Note,

Note, 18 Gallons is a Rundlet.

*31 $\frac{1}{2}$ Gallons, is a Wine, or Vinegar Barrel.
A Tun weighs 18 C. *Avoirdupois.**

Note, Oil and Honey are measured by Wine measure.

Note, That Oil hath but 236 Gallons to the Tun except Whale Oil, or Oil from Greenland, which hath 252 to the Tun.

In BEER MEASURE

82 Solid Inches,	} make	{	1 Gallon.
9 Gallons,			1 Firkin.
2 Firkins,			1 Kilderkin.
2 Kilderkins,			1 Barrel.
1 $\frac{1}{2}$ Barrel, or 54 Gallons.			1 Hoghead.

Note, That in all other places besides London, the Firkin of Ale and Beer contains 8 $\frac{1}{2}$ Gallons.

A Barrel of Beer are	{	10152 Solid Inches.
		288 Pints.
		144 Quarts.
		72 Pottles.
		36 Gallons.
		4 Firkins.
		2 Kilderkins.

Note, That 3 Barrels, or 108 Gall. make 1 Butt of Beer.

ALE MEASURE.

Solid Inches,	} make	{	1 Gallon.
Gallons,			1 Firkin of Ale, Soap,
			or Herrings.
Firkins,			1 Kilderkin.
1 Barr. or 48 Gal.			1 Hoghead.

In

In a Barrel of *Ale* are, {

- 9024 Solid Inches.
- 256 Pints.
- 128 Quarts.
- 64 Pottles.
- 32 Gallons.
- 4 Firkins.
- 3 Kilderkins.

The *Beer* and *Ale* gallons are the same, viz. 282 solid inches, but with this difference, i. e. the barrel of *Beer* contains 1128 cubic inches more than the barrel of *Ale*, that is, 4 gallons.

Examples of Wine Measure.

(10)	(4)	(63)	(8)	(10)	(4)	(63)	(8)
Tuns.	Hds.	Gal.	Pints.	Tuns.	Hds.	Gal.	Pints.
71	2	19	4	75	2	24	7
24	1	27	6	44	1	17	2
12	2	56	4	27	1	46	6
42	0	37	7	29	1	19	4
15	3	60	2	24	3	46	4
166	3	12	7	201	2	28	7

DRY MEASURE.

By this are measured all sorts of *Grain*, *Salt*, *S*
cal, &c.

Note, That {

- 2 Pints
- 2 Quarts
- 2 Pottles
- 2 Gallons
- 4 Pecks
- 8 Bushels
- 4 Quarters
- 5 Quarters
- 2 Wey,

is {

- 1 Quart,
- 1 Pottle,
- 1 Gallon,
- 1 Peck,
- 1 Bushel,
- 1 Quarter, or 2 Corn,
- 1 Chaldron,
- 1 Wey,
- 1 Last,

Note. Four pecks is one bushel, land measure, and 5 pecks, one bushel, water measure.

Observe likewise, That when *Salt* and *Sea-coal* are measured by the corn-measure, they are heaped; or else there are 5 striked pecks to the bushels; and 36 bushels is a chaldron of coals; there being 21 chaldron to the score, in the river of *Thames*.

A gallon contains $268\frac{2}{3}$ cubic inches; and a bushel of corn $2150\frac{2}{3}$ cubic inches.

Note. A bushel ought to be $18\frac{1}{2}$ inches wide, and 18 inches deep; as by act of parliament, in 1697.

Some make 6 quarters of meal a wey; and 1 wey, 3 quarters, a last.

Examples of Dry measure.

(10)	(8)	(4)	(2)
Qu.	Bush.	Pecks	Gal.

24	6	2	1
----	---	---	---

17	3	2	0
----	---	---	---

20	7	1	1
----	---	---	---

15	5	0	1
----	---	---	---

21	2	1	1
----	---	---	---

19	4	2	0
----	---	---	---

119	5	2	0
-----	---	---	---

(10)	(4)	(8)	(4)
Cha.	Qu.	Bush.	Pecks.

174	3	6	3
-----	---	---	---

241	1	7	2
-----	---	---	---

296	2	4	3
-----	---	---	---

171	1	5	0
-----	---	---	---

097	0	5	2
-----	---	---	---

471	2	4	3
-----	---	---	---

1453	1	2	1
------	---	---	---

LONG MEASURE.

Note, {

- 3 Barley-corns make one Inch.
- 12 Inches one Foot.
- 3 Foot one Yard.
- 3 Foot 9 Inches, one Ell English.
- 2 Yards, or 6 Foot, one Fathom.
- 5 Yards $\frac{1}{2}$, or 16 Foot $\frac{1}{2}$, 1 Pole.
- 40 Square Poles, or 220 Yards, one Furlong.
- 8 Furlongs, or 1760 Yards, one Mile.
- 3 Miles one League.
- 60 Minutes 1 Degree, which is equal to about 69 *English* Miles.
- 360 Degrees, or 24840 Miles, is equal to the Circumference of the Earth and the Sea.

Note, That an *English* Mile is 286 Feet less than an *Italian* Mile. And that 5 Foot is a Geometrical Pace.

In a Mile are {

- 190080 Barley-Corns.
- 63360 Inches.
- 5280 Feet.
- 1760 Yards.
- 320 Poles.
- 8 Furlongs.
- 80 Chains.
- 1056 Paces.
- 1408 Ells.
- 8000 Links of the Chain.

Example

14

Examples in Long Measure.

(10)	(8)	(40)	(10)	(8)	(40)
Miles.	Furl.	Poles.	Miles.	Furl.	Poles.
24	6	22	37	4	21
37	5	26	20	3	17
15	4	34	42	5	19
74	3	39	31	6	27
41	7	24	52	4	19
194	4	25	185	0	23

From the preceding table of *Long Measure*, is deduced this of *Land Measure*, viz.

Forty poles, (or perches) in length, and 4 in breadth, make an acre, or 160 square perches. Or 4840 square yards make an acre; or 43560 square feet.

A *Hide* of land is 100 acres; 40 square poles make a rood, and 4 roods an acre.

Note, The pole, or perch, of 16 foot $\frac{1}{2}$ is *Statute Measure*; but there are some customary measures which are more; as for fens and wood-lands, there are reckoned 18 foot to the pole; and for forests 21 foot to the pole.

Examples.

(10)	(4)	(40)	(10)	(4)	(40)
Acres.	Roods.	Poles.	Acres.	Roods.	Poles.
14	2	24	74	2	27
26	3	29	61	1	20
17	1	19	20	2	36
26	2	20	14	3	11
36	2	36	37	1	10
24	1	12	27	2	34
146	2	20	236	2	18

T I M E.

Is measured by years, months, days, hours, and minutes; as in the table following:

<i>Mark'd</i>			<i>In a Year are</i>
60 ["] Seconds	} make	1 Minute.	31557600 Seco.
60' Minutes		1 Hour.	525960 Min.
24 Hours		1 Day natural.	8766 hours
7 Days		1 Week.	365 days
4 Weeks		1 Month.	52 weeks
13 Months		1 Solar Year.	
(1 Day, and 6 Hours.			

A *Century* is 100 years; an *Indiction* among the *Romans*, a revolution of 15 years.

Of the Motion of the heavenly Bodies.

60" Seconds	}	make	1 Minute.
60' Minutes			1 Degree.
30 Degrees			1 Sign.
12 Signs, or 360 Degrees			1 Revolution of the
			(whole Sphere, or 360 Degrees.

D O Z E N S.

There are several commodities sold by the dozen, a table of which follows, *viz.*

In a great Gros are	1728 Pieces or Things.
	144 Dozens.
	12 Small Gros.

S Q U A R E

S Q U A R E Measure.

16 Quarters of an Inch	}	is	{	one Inch
44 Inches				one Foot.
9 Foot				one Yard.
30 Yards $\frac{1}{2}$ or 272 $\frac{1}{2}$ square Feet				one Pole.
40 Poles long, and 1 broad				one Rood.
4 Roods				one Acre.
640 Acres				one Mile.

In a square acre are 4 square roods, 160 square poles, &c. and in a square pole, 30 square yards $\frac{1}{2}$.

In a square mile are,	{	4014489600 Inches.
		27878400 Feet.
		3097600 Yards.
		102400 Poles.
		2560 Roods.
		640 Acres.

Some other things necessary to be known, and of use in Arithmetic.

O f F I S H.

124 of *Ling, Cod, or Haberdine*, to the hundred, viz

120	}	accounted	{	100
1200				1000, or a Barrel.
12000				A Last, or 12 Barrels.

P A P E R and P A R C H M E N T.

1 Bale is 10 Ream; 1 Ream 20 Quires; 1 Quire 24 (or 25) Sheets; 1 Roll of Parchment, 5 Dozen, 1 Dozen, 12 Skins.

OF WOOD.

A Cord of Wood is 4 foot over, 4 foot deep, and 8 foot long, being 128 cubic feet. A Stack of Wood is 3 foot over, 3 foot deep, and 12 foot long, being 108 cubic feet.

Block Wood, being great Logs, are sold by the Cord, and small by the Stack. A cubic foot is 1728 cubic inches. A cubic yard, 27 cubic feet, or 46656 inches. 4 inches is a hand, in measuring a horse. 2 foot is 1 pace, 4 poles, or 100 links, 1 chain. 125 geometrical paces 1 stade, 8 stades an *Italian mile*. 4000 geometrical paces a small *German mile*, and 5000 a great. 160 perches in length, and 1 in breadth; or 80 in length, and 2 in breadth; or 40 in length, and 4 in breadth, make an acre of land. 10 foot every way is a square; that is 100 square feet. A faggot of *Steel*, 120 lb. A burden of *Gad-steel*, 9 score, or 180 lb. A sack of coals, 3 bushels; *Scots coals* 112 lb. to the C. A load of timber 50 foot, a tun 40. A load of hay, 36 trusses, and 56 lb. the truss; or 4 stone, at 14 lb. the stone; but new hay ought to be 60 lb the truss. 500 of bricks a load; and a 1000 plain tiles the same. 25 bushels of lime 1 C. A brick ought to be 9 inches long, $4\frac{1}{2}$ broad, and $2\frac{1}{2}$ thick. A tun of train-oil, 252 gallons; a tun of sweet-oil 236 gallons. Raw silk (except *China*) is 24 ounces to the pound. A tun of lead, called a fodder, $19\frac{1}{2}$ C. A gallon of wheaten meal weighs 7 lb. *Avoirdupois*. A dicker of hides, or skins, are 10; and 20 dickers a last. A stone of glass is 5 lb; a seam of glass is 24 stone. 40 skins make a timber of *Sables*, *Martins*, *Minks*, *Jennits*, *Fitches*, and *Greys*. 120 to the hundred of *Cpnies*, *Kid*, *Lamb*, *Budge*, and *Cat-skins*; 50 to a kid of *Goat-skins*; and 13 tann'd *Calf-skins* a dozen.

CHAP. III.

SUBTRACTION.

IS the taking of a lesser number, or sum out of a greater, thereby to find the remainder, or difference between the said two numbers: As if you take 3 from 19, the remainder, or difference is 6.

SUBTRACTION is of one denomination, or of divers.

Of one, when the two numbers are both of one kind; that is, both *yards, gallons, pounds, etc.*

Of divers, when the two sums consist of *pounds, shillings, and pence; or tuns, hundreds, quarters, and pounds, etc.*

SUBTRACTION is just the reverse of *Addition*; for *that* puts numbers together, and *this* takes numbers from each other.

In setting down numbers for work, you must always place the greater number, or sum, uppermost; and in such order, that units may stand under units, tens under tens, hundreds under hundreds, &c. as before in *Addition*.

A General Rule.

Whatever you stop at in *Addition*, the same you must borrow in *Subtraction*, when need requires, remembering always to pay it to the next figure towards the left hand.

E 3

Example

Example 1.

Suppose I would know the difference between 453 yards bought, and 232 yards sold.

I set them down as underneath, and as before recited, viz.

	<i>Yards.</i>
<i>Bought,</i>	453 greater number.
<i>Sold,</i>	232 the lesser.
<i>Difference,</i>	221 remains, unfold.
	453 Proof.

After I have drawn a line under the sum, I begin at the first figure towards the right hand, (as in *Addition*) and say, 2 from 3, (the figure just over it) and there remains 1, setting it in its proper place under the line; and then go to the next figure, saying 3 from 5, and there remains 2, which I also put under the line; and then to the last figure, saying 2 from 4, and there remains 2, and the work is done, and I find the remainder of yards unfold to be 221, or that 453 is 221 more than 232; to prove the truth of which, I add the remainder, or difference to the lesser number; and if they two, put together make the greater, or upper number, the sum is right, otherwise not; wherefore I say, 1 and 2 is 3; and 2 and 3 is 5; and 2 and 2 is 4, which are the same figures with the upper, or greater number. Wherefore I know the work is right, as may be seen in the example. And by this way are all sums of one denomination prov'd in this rule.

Example 2.

Let it be required to find the difference between 756 gallons received, and 444 gallons delivered. To which

to which, I set the numbers, the one under the other, as before directed, and they stand thus.

Gall.

756 Greater.

444 Lesser.

312 Rem.

756 Proof.

Then having drawn a line under them, I begin and say, 4 from 6, and there rests 2; and 4 from 5, and there remains 1; and 4 from 7, and there remains 3: so the work being done, I find the difference to be 312; or so many gallons remaining. And it is proved by *Addition*, as before; as may be seen by the work above.

When any one of the under figures is greater than the figure over it, then you must borrow 10, (as you carried 10 in *Addition*) and put it to the figure from whence you were to subtract, and then take it from their sum, paying 1 for the said 10 borrowed, to the next figure towards the left hand in the lower line.

Example 3.

I would subtract 496 pounds paid, from 654 pounds lent; viz.

1.

Lent, 654 Greater.

Paid, 496 Lesser.

158 rests due.

654 Proof.

Having set down the numbers, as before directed with a line under them, I say, 6 from 4 I cannot, (but

(but putting 10 to the said 4, it is made 14) 6 from 14, and there remains 8, which I set down under the line; then I say, 1 that I borrowed, and 9 (the next figure) is 10, from 5 I cannot, but 10 from 15 (adding 10 to the 5) and there rests 5, which I also set down; then 1 that I borrowed, and 4 is 5, from 6, and there remains 1. The sum being thus finished, I find that there remains due, or unpaid, 158 pounds, which is proved by *Addition*, as before.

Example 4.

Suppose there is advanced on a *Subsidy*.

	l.
	636420
Paid off,	47294
Remainder,	589126
Proof,	636420

How much remains?

Here I say, 4 from nothing I cannot, but 4 from 10, and there remains 6; 1 that I borrowed, and 9 is 10, from 2 I cannot, but 10 from 12, and there rests 2; then 1 that I borrowed, and 2 is 3, from 4, and there remains 1; (here I borrow none, so must not pay any thing to the next figure) then 7 from 1 I cannot, but 7 from 16, and there remains 9; 1 that I borrowed, and 4 is 5, from 3 I cannot, but 5 from 13, and there remains 8; and now, because there is no figure standing under the 6, to carry the 1 borrowed to, I suppose a (0) to be placed there, and say 1 that I borrowed, and 0 is 1, from 6, and there remains 5; and so the work is done, and the remainder is 589126, as in the *Example*.

More examples for practice.

Borrowed, 14075
Paid 08424

Rest due, 5651

Proof, 14075

Bought, 74000
Sold, 29460

Rest unfold, 44540

Proof, 74000

Sheep.

Received, 492
Delivered, 397

Remains, 95

Proof, 492

Advanced, 47692
Paid off, 29767

Remains, 17925

Proof, 47692

Some questions proper to this Rule, shewing its nature and use.

Quest. 1. What is the difference between a piece of timber, containing 56 feet, and another piece of 29 feet?

Feet.

56

29

Answ. 27

Quest. 2. A man borrowed, l. 96 and paid 58, what remains?

96

58

Answ. 38

Quest.

Quest. 3. If a person hath 150 miles to travel, and hath gone 99 miles, how many miles hath he yet to go?

Miles.

150

99

Answ. 51

*From 100 pounds borrowed, take 72 paid;
'Twas a virgin that lent it, what's due to the maid*

Answ. l. 28

Quest. 4. If a person be 48 years of age, this present year, what year was he born in?

Years.

1759

48

Answ. 1711

Quest. 5. How many years since the Spanish invasion, it being in the year 1588?

r.

Greater number 1759

Lesser number 1588

171

From 90 take 30, from 40 take 10;

Subtract 6 from 60, and what remains then?

Answ. 144

Qu

Quest. 6. What number must be put to 297. to make it 730?

730

297

433

730

*Fifteen hundred 92 there dy'd a noble prince :
How many years is it ago, that is, how many since ?*

1759

1592

Answ. 167

Quest. 7. What five numbers, and all different, will make 65?

To do this, set down four different numbers at random, observing that they do not amount to the number proposed; and add them together, and subtract that total from the number proposed, and the remainder will be the 5th number, to make the other numbers 65, as in the following

Example.

65 The number proposed.

—

12

13

9 The four numbers set
16 down at random.

—

50 Total.

—

15 The 5th number.

—

And

And so of any other number proposed to be made up by different numbers, let them be 5, 6, 7, &c. Remembling always, that the random numbers be less than the numbers proposed to make up the number assigned.

of MONEY.

When the sums to be subtracted, are of divers denominations, whether they be *money, weight, or measure*, the same method must be observed in setting them down, as in *Addition*; that is, the several names must be set just under one another; as pounds under pounds, shillings under shillings, and pence under pence, &c. with *points or strokes of separation* between them; always observing, that the great sum must be uppermost, as before, in sums of one denomination. Then proceed to take the under sum out of the uppermost, beginning at the least denomination towards the right hand, as in *Addition*; and the same respect must be had, when there is occasion to borrow as before in *Addition*, observing how many of the lesser denomination makes one of the next greater, and borrow accordingly; remembling the ways to pay what you borrow to the next denomination.

Example.

I would subtract 247*l.* 11*s.* 9*d.* $\frac{1}{2}$. *Disbursement* from 372*l.* 11*s.* 6*d.* $\frac{1}{2}$. *Received*. To do which set them down as before directed; and then they stand thus.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
Received,	372	11	6 $\frac{1}{2}$	Greater.
Disbursement.	247	11	9 $\frac{1}{2}$	Lesser.
Remains.	124	19	8 $\frac{1}{2}$	
Proof.	372	11	6 $\frac{1}{2}$	

I begin at the least denomination towards the right hand

and, viz. farthings; saying, 2 from 1 I cannot, therefore I borrow one from the next name, which is pence, one of which is 2 farthings, but 2 from 4 and there remains 2, which remainder always add to the upper number, or figure you subtract from, for the more easy reckoning) and the 1 farthing over it makes $\frac{3}{4}$, which I place under the line, and go to the next denomination of Pence, saying, 1 that I borrowed, and 9 is 10, from 6 pence I cannot, but I borrow of the next, which is shillings, one of which is 12 pence; but 10 pence from 12 pence, and there remains 2, which I put to the figure 6 I subtract from, and it makes 8, which I also put under the line, in its proper place, and then I go to the next denomination, which is shillings, saying, 1 that I borrowed, and 11 is 12, from 11 shillings I cannot, wherefore I borrow 1 of the next, which is pounds, (one of which is 20 shillings) but 12 from 20 and there remains 8, and the 11 shillings over it, which I subtract from, makes 19, which I place under the line, in its place, then going to the pounds, I say, 1 that I borrowed, and 7 is 8 from 2 I cannot, (here I borrow 10, as in sums of the denomination) but 8 from 12, and there remains 4; then, 1 that I borrowed, and 4 is 5, from 7 and there remains 2; and lastly, 2 from three and there remains 1; And so the sum is finished, and the remainder, or difference is 124*l.* 19*s.* 8*d.* $\frac{3}{4}$, as by the sample may be seen.

Example 2.

A Collector of the *Excise*, has received 2479*l.* 12*s.* $\frac{3}{4}$, and paid into the office by several remittances, 1977*l.* 11*s.* 2*d.* How much remains in his hands?

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Received,	2479	12	6 $\frac{3}{4}$
Paid,	1977	11	2
	502	01	4 $\frac{3}{4}$
Proof,	2479	12	6 $\frac{3}{4}$

F

Here

50. SUBTRACTION. Chap. III

Here I begin, and say, nothing from $\frac{1}{2}$, and there remains $\frac{1}{2}$; then 2 from 6, and there remains 4; and 11 from 12, and there remains 1; and then I go to the pounds, saying 7 from 9, and there remains 2; and 7 from 7, and there remains 0; and 9 from 4 cannot, but 9 from 14, and there remains 5; and that I borrowed, and 1 is 2, from 2, and there remains 0; and so the sum is done; and he hath remaining in his hands, 502l. 01s. 4d. $\frac{1}{2}$, as by the said work

More examples for practice.

	(20)(12)			(20)(12)			(10)(20)(12)		
	l.	s.	d.	l.	s.	d.	l.	s.	d.
From	7	10	1	5	00	0	77	00	
Take	4	07	9	3	11	5	57	04	
Rem.	3	02	4	1	08	7	19	16	
Proof.	7	10	1	5	00	0	77	00	

	(20)(12)(4)				(10)(20)(12)(4)				(20)(12)		
	l.	s.	d.		l.	s.	d.		l.	s.	d.
Dr.	7	11	1	$\frac{1}{2}$	476	10	9	$\frac{1}{2}$	7	00	0
Cr.	4	17	3	$\frac{1}{4}$	277	17	7	$\frac{1}{4}$	4	10	4
Bal.	2	13	10	$\frac{1}{4}$	198	13	2		2	09	7
Pr.	7	11	1	$\frac{1}{2}$	476	10	9	$\frac{1}{4}$	7	00	0

	(10)(20)(12)(4)				(10)(20)(12)(4)			
	l.	s.	d.	q.	l.	s.	d.	
Borrowed,	419	02	10	$\frac{1}{4}$	7174	11	1	
Paid,	197	03	10	$\frac{1}{2}$	2176	15	9	$\frac{1}{4}$
Rem. due,	221	18	11	$\frac{1}{2}$	4997	15	3	$\frac{3}{4}$
Proof.	419	02	10	$\frac{1}{4}$	7174	11	1	

When

chap. III. SUBTRACTION. 51

When a sum is borrowed, or a debt paid, at several times, then you must add the several sums of payment into one total, and subtract that total from the first lent, or otherwise due.

Example.

Suppose *A.* lends *B.* 70*l.* and *B.* hath paid *A.* at several times, viz.

Lent, — —	70	00	0
Paid at one time,	24	10	0
Another time,	7	11	6
Another, — —	20	00	0
Another, — —	4	10	6
Another, — —	1	01	6
<i>Paid in all,</i>	57	13	6
<i>Remains due,</i>	12	06	6
<i>Proof,</i>	70	00	0

To prove this, add the sum paid in all, and the sum resting due, together; and if they make the sum first lent, the work is right.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>	<i>s.</i>	<i>d.</i>
Lent,	7	10	0	560	10	9½	1	01	6
Paid at several times.	1	10	6	146	10	5	0	07	6
	0	11	9	17	15	0	0	01	6
	0	07	6	97	7	6	0	02	6
	2	10	6	76	00	0	0	01	6
	6	07	9	100	17	4	0	02	0
	1	10	0	100	01	7	0	01	0
<i>Paid in all</i>	6	18	0	538	11	10	0	16	0
<i>Rem.</i>	0	12	0	21	18	11½	0	05	6
<i>Proof,</i>	7	10	0	560	10	9½	1	01	6

A familiar example.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
Received of Mr East, ———	59	06	0
<i>Pd.</i> to Mr West, ———	20	00	0
<i>Pd.</i> to Mr North, ———	14	13	6
<i>Pd.</i> to Mr South, ———	15	12	0
	50	05	6
Remains in the Bag.	09	00	6

What eight sums of pounds, shillings and pence and all different, will amount to just 50 *l.*

To do this, you must observe the directions given in page 47. *example 7.* for sums of one denomination; and see the following work.

From *l.* 50 00 0 the sum assigned.

The seven sums set down at ran- dom.	{	4	17	6
		5	01	6
		1	01	6
		7	11	4
		6	04	2
		9	03	9
		1	13	5
Subtract		35	13	2
Remainder,		14	06	10 the eight sum.

AVOIRDUPOIS-WEIGHT.

Here you are only to observe the title of your account, and borrow according, when there is occasion.

Example

Example 1.

An Ironmonger buys 74 Tuns 13C. 2qrs. 14lb. of
 Iron, and hath sold out of the said Parcel, 56
 Tuns, 11C. 1qr. 20lb. how much remains unsold.

I set down the sum as before directed, that each de-
 nomination may stand under that of the same kind,
 and draw a line, under them, as may be seen in the
 margin.

I begin at the right hand,
 and say, 20 from 14 I can-
 not, but 20 from 28, (so ma-
 y lb. making a qr. of a
 hundred, an integer of the
 next name,) and there re-
 mains 8; which add to the
 1, and they make 22, which
 I place under the line; and
 so to the quarters, and say,

	(10)	(2Q)	(4)	(28)
Tuns.	C.	qrs.	lb.	
74	13	2	14	
56	11	1	20	
18	02	0	22	
pr. 74	13	2	14	

that I borrowed, and 1 is 2, from 2 and there re-
 mains 0; which I also set down, then 11 from 13C.
 and there rests 2, which I likewise put down, and go
 to the tuns, saying 6 from 4 I cannot, but 6 from 14,
 and there remains 8; then 1 that I borrowed, and 5
 6, from 7, and there rests 1. And so the work is
 done, and I find there remains unsold 18 Tuns 2C.
 22lb.

Example 2.

A Grocer buys 96C. 2qrs. 20lb. of Raisins, and sells
 out again, 49C. 3qrs. 24lb. what quantity remains in
 his hands?

	C.	qr.	lb.	
Bought,	96	2	20	greater number.
Sold,	49	3	24	lesser number.
remains in his hands	46	2	24	
	96	2	20	

Here I say, 24 from 20 I cannot, but 24 from 20 and there remains 4; and the 20 over it makes 24 which I set down; then 1 that I borrow, and 3 is 4 from 2 I cannot, but 4 from 4, and there rests 0 but 2 that stands over it, is 2, which I set down: then 1 that I borrowed, and 6 is 7 from 6 I cannot, but 7 from 16, and there rests 9, and 1 that I borrowed and 4 is 5, from 9, and there remains 4. So there remains in his hands 46*C.* 2*qrs* 24*lb.* which is proved by *Addition*, by adding the remainder and *lessor* sum together, and they make the *greater*; and therefore the work is right.

Examples for Practice.

	(10)	(20)	(4)	(28)		(10)	(4)	(28)
	<i>Tuns.</i>	<i>C.</i>	<i>qrs.</i>	<i>lb.</i>		<i>C.</i>	<i>qrs.</i>	<i>lb.</i>
<i>Received,</i>	700	11	1	17		756	3	2
<i>Deduct,</i>	421	04	2	20		327	1	2
<i>Rem.</i>	279	06	2	25		429	1	2
<i>Proof.</i>	700	11	1	17		756	3	2

<i>C.</i>	<i>qrs.</i>	<i>lb.</i>	<i>C.</i>	<i>qrs.</i>	<i>lb.</i>	<i>C.</i>	<i>qrs.</i>	<i>lb.</i>
4	0	12	24	1	12	9	0	00
3	1	07	19	2	24	5	3	15
6	3	05	04	2	16	3	0	13
4	0	12	24	1	12	9	0	00

Admit I have on board of a Ship from *Jamaica*, 9 *Tuns.* 13*C.* 0*qrs.* 00*lb.* of *Log-Wood*, and have received by several *Lighters*, as follows, *viz.*

	(10) <i>Tuns.</i>	(20) <i>C.</i>	(4) <i>grs.</i>	(28) <i>lb.</i>
On board,	94	13	0	00
By one Lighter,	12	11	3	09
Another,	19	14	0	21
Another,	17	12	2	24
Another,	15	14	3	06
Received,	65	13	2	04
Remains on board,	28	19	1	24

(10) <i>C.</i>	(4) <i>grs.</i>	(28) <i>lb.</i>	(10) <i>C.</i>	(4) <i>grs.</i>	(28) <i>lb.</i>
49	3	22	70	2	20

Sold at several times.

4	1	24	10	1	14
9	2	17	7	2	14
4	1	25	1	1	20
7	3	20	12	1	19
8	1	27	9	3	12
9	2	20	10	0	00

Sold in all,

44	2	21	51	2	23
----	---	----	----	---	----

Rem, unfold,

5	1	01	18	3	25
---	---	----	----	---	----

Proof.

49	3	22	70	2	20
----	---	----	----	---	----

AVOIRDUPOIS SMALL WEIGHT.

	(10) <i>lb.</i>	(16) <i>oz.</i>	(16) <i>dr.</i>	(10) <i>lb.</i>	(16) <i>oz.</i>	(16) <i>dr.</i>
Delivered,	4	10	14	46	13	10
Received,	2	09	9	27	15	14
Rem.	2	01	05	18	13	12
Proof.	4	10	14	46	13	10

	(10)	(16)	(16)		(10)	(16)	(16)
	lb.	oz.	dr.		lb.	oz.	dr.
Delivered	55	00	00		79	15	14
Received	37	10	14		49	15	15
Rests due	17	05	02		29	15	15
Proof.	55	00	00		79	15	14

TROY-WEIGHT.

	(10)	(12)	(20)	(24)		(10)	(20)	(24)
	lb.	oz.	dwt.	gr.		oz.	dwt.	gr.
Received	24	09	14	12		756	12	15
Melted	19	07	19	20		478	11	22
Remains	05	01	18	16		278	09	17
Proof.	24	09	14	12		756	12	15

	(10)	(12)	(20)	(24)		(10)	(20)	(24)
	lb.	oz.	dwt.	gr.		oz.	dwt.	gr.
Received	370	07	12	20		7420	5	20
Delivered	174	11	09	22		5789	18	15
Remains	195	08	02	22		1630	17	05
Proof.	370	07	12	20		7420	15	20

CLOTH MEASURE.

	(10)	(4)	(4)		(10)	(5)	(4)
	Yds.	qrs.	N.		Ells	Eng.	qrs.
Bought	54	2	2		420	3	2
Sold	27	2	3		247	4	3
Remains	26	3	3		172	3	3
Proof	54	2	2		420	3	2

I might give examples in *Subtraction* of all the other Rules mentioned before in *Addition*, viz. of *Apothecaries Weight*, *Dry* and *Liquid Measure*, etc. but all of them being worked in the same manner with those before, it is unnecessary.

CHAP. IV.

MULTIPLICATION.

I. IN this Rule there are always two numbers given to find out a third, which will contain either of the given numbers, as often as the other containeth units.

II. This Rule also excellently and most concisely performeth the work of *Addition*, either in simple or compound numbers; as shall be illustrated and proved by fundry *Examples*, *Explications*, and *Improvements*, not hitherto treated of.

III. It likewise serveth to bring great denominations into less, of the same value; as *Pounds* into *Farthings*; and *Tuns Weight* into *Paunds*, etc.

IV. *Multiplication* hath three parts, or things, particularly to be noted, and known, viz.

1st, The *Multiplicand*, or number to be multiplied; and is generally the greatest of the two numbers given.

2dly, The *Multiplier*, or number by which you multiply; and is generally the least of the two numbers given.

3dly, The *Product*, or result of the *Multiplication*; which is the answer.

V. Before any Procedure can be made, the following *Table* must be got perfectly by Heart.

M U L

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MULTIPLICATION-TABLE.

2 Times, or rather twice	2 is	4
	3	6
	4	8
	5	10
	6	12
	7	14
	8	16
	9	18
	10	20
	11	22
	12	24

3 Times	3 is	9
	4	12
	5	15
	6	18
	7	21
	8	24
	9	27
	10	30
	11	33
	12	36

4 Times	4 is	16
	5	20
	6	24
	7	28
	8	32
	9	36
	10	40
	11	44
	12	48

5 Times	5 is	25
	6	30
	7	35
	8	40
	9	45

5 Times	10 is	50
	11	55
	12	60

6 Times	6 is	36
	7	42
	8	48
	9	54
	10	60
	11	66
	12	72

7 Times	7 is	49
	8	56
	9	63
	10	70
	11	77
	12	84

8 Times	8 is	64
	9	72
	10	80
	11	88
	12	96

9 Times	9 is	81
	10	90
	11	99
	12	108

10 Times	10 is	100
	11	110
	12	120

11 Times	11 is	121
	12	132

12 Times	12 is	144
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The

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The foregoing table is so plain and easy, that it needs no explanation; and therefore I shall proceed immediately to the rule of working.

VI. When any number is given to be multiplied by another, set the biggest uppermost, which is the *Multiplicand*, and under that your *Multiplier*, in the same Order as in *Addition* and *Subtraction*, viz. Units under units, tens under tens, &c. Then draw a line, and proceed, beginning at the right hand, and multiply every particular Figure of the *Multiplicand* by the *Multiplier*.

Example 1.

How much is 3 times 472 *Multiplicand*?
3 *Multiplier*.

Ans. 1416 *Product*.

Here I say, 3 times 2 is 6, which I put under the line, as in the *Example*; then 3 times 7 is 21, I set down 1, and carry 2, for the two tens, to the next; (as in *Addition* of one denomination) then 3 times 4 is 12, and 2 that I carry is 14; so, because it is the last figure, I set down the 14, and the work is done, so I find that 3 times 472 is 1416, the *Product*, or result of 472 multiplied by 3.

If the said 472 be three times set down, one under the other, and added together, the Total will be the same with the *Product* above, which shews, that *Multiplication* briefly performs the work of *Addition*, (as was said before) which is shewn in the Margin.

$$\begin{array}{r} 472 \\ 472 \\ 472 \\ \hline 1416 \end{array}$$

Example

Example 2.

How many makes 742 *Multiplicand*.
Multiplied by 4 *Multiplier*.

2968 *Product*.

Here I say, 4 times 2 is 8, which I set down under the line; then 4 times 4 is 16; I set down 6, and carry 1 for the ten for the next figure; then 4 times 7 is 28, and 1 that I carry is 29; and it being the last, I set it down; so the work is done, and I find the *Product*, or answer, to be 2968, as above.

To prove the work, multiply the *Multiplier* by the *Multiplicand*, and if the product is the same figure as before, it is right. This is the quickest and best way of proving *Multiplication*, till *Division* be known.

I do not move the sum to any other place, but let it stand as before multiply'd, and begin with the first figure of the *Multiplicand*, towards the right hand, to multiply the *Multiplier*, saying twice 4 is 8, which I find to be right. Then to the next figure, which is 4, and multiply the *Multiplier* by that, saying, 4 times 4 is 16, which is 6, and carry 1, which I also find right. Then to the next and last figure in the *Multiplicand*, which is 7, and multiply the *Multiplier* by that also, saying, 7 times 4 is 28, and 1 that I carried is 29, which I likewise find right: and so the work is prov'd, and known to be truly wrought.

Example 3.

What is the product of 90704 *Multiplicand*.
Multiplied by 8 *Multiplier*.

725632 *Product*.

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Here I begin, saying, 8 times 4 is 32, I set down 2, and carry 3; then 8 times 0 is 0, but 3 that I carry is 3; then 8 times 7 is 56, I set down 6 and carry 5, then 8 times 0 is 0, but 5 that I carry is 5. Lastly, 8 times 9 is 72, which I set down, and the work is done: as by the *example* above. And this is proved as before, by multiplying the *Multiplier* by the *Multiplicand*, saying 4 times 8 is 32, &c.

This way of proof is also a perfecting any one in the *Multiplication-Table*; because the digits, or nine figures, are multiplied forwards and backwards: so that they may as readily answer, that 9 times 8 is 72, (not found in the table, but reversely) as that 8 times 9 is the same.

More examples for practice.

Multiply 7460 *Multiplicand*
By 7 *Multiplier*

52220 *Product, or Answer.*

How many are 9 times 365?
Or, how many days in 9 Years?

3285

Multiplicand 432107
Multiplier 5
2160535

596432
6

3578592

709543
7

675908
8

7654309
9

4966801

5407264

68888781

G

VII.

VII When the Multiplier consists of more figures than one, then there must be as many several Products as there are figures in the Multiplier, and placed under the line, and added together, and the total is the whole product required. But observe always to place the first figure of each product just under the figure you multiply by, and so you move one place towards the left hand for every product, be as many as there will.

Example 1.

How much is 24 times 365 Multiplicand?
or, how many hours in a year? 24 Multiplier.

1460 Product by 4
730 Product by 2

8760 Total Product

The numbers being placed in order as above, and according to the VIth *rule* of this chapter, after having drawn a line under them, I begin with the first figure in the Multiplier, viz. 4, saying, 4 times 5 is 20, set down 0, and carry 2; then 4 times 6 is 24, and 2 carry is 26, that is 6 and carry 2; then 4 times 3 is 12, and 2 is 14; and so I have done with the figure 4. Then I go to the second figure in the Multiplier. viz. 2, and multiply the Multiplicand 365, by that also, saying twice 5 is 10, I set down 0 and carry 1, which 0 I set down just under the figure 2, that I multiply by, and go a place farther to the left hand, as was said before. Then I go on, saying, twice 6 is 12, and that I carry is 13, that is 3, and carry 1, and twice 3 is 6, and 1 is 7; and so I have done with this figure of the Multiplier also; and then I draw a line under these two Products, and add them together, and they make 8760 for Answer. And so the work is done, and may be seen in the *example* above, and may be proved as before.

Example

Example 2.

Let it be required to multiply	527537
By — — —	285
	2637685
	4220296
	1055074
	150348045

A line being drawn under the two numbers, I proceed, saying, 5 times 7 is 35, &c. going thro' all the figures of the Multiplicand by 5, and find its product to be 2637685, then I go to the next figure in the Multiplier, viz. 8, and multiply all the figures of the Multiplicand by that also; and find the product 4220296, then I multiply the Multiplicand by the last figure, viz. 2. and the product by that is 1055074. Then drawing a line under these three products, I add them together, and find their total to be 150348045, for the true product sought: That is, I find that 285 times 527537 amounts to 150348045; as by the work above may be seen.

VIII. Whenever the Multiplier is such a number, that any two numbers of the Multiplication-table being multiplied together, make the said Multiplier; as in the foregoing page, where the Multiplier is 24, and is made by multiplying 6 and 4 together. Then if you multiply the Multiplicand by either of them numbers, that is either 6 or 4, and then multiply that product by the other number, the last product shall be the answer, and the same with the other way.

Example.

365 multiplied

4

1460

6

— Product agreeable to the 1st example.
8760 And so of any other.

*There are, sometimes, figures, saved by this method
and there is no addition of products.*

More examples.

4765	6796	476
14	17	19
19060	47572	4284
4765	6796	476
66710	115532	9044
56071592	275827	
123	19725	
168214776	1379135	
112143184	551654	
56071592	1930789	
	2482443	
6896805816	275827	
	5440687575	

How

8

the m

How to prove Multiplication by the Cross.

The common way used in *Schools* is this: They make a *cross* thus X, then add all the figures in the Multiplicand together, as in *Addition* and cast away the nines, as oft as they arise, and bear the remainder to the next figure; when they come to the end of the line, they note what remains after the nines are cast away, and set such remainder on the left side of the *cross*; then they do the same by the Multiplier, and note what remains there also, setting that on the right of the *cross*; then they multiply them two figures together, and cast the nines out of that product, setting the remainder on the top of the *cross*: Lastly, they cast away the nines out of the product, and if the remainder be like the figure on the top of the *cross*, they set it down at the bottom and conclude the work right.

But this way of proof is not infallible, as I have experienced many times: But this may be said for it, that if a sum be done right, it will never appear to be wrong by this way; but it many times makes a sum appear right, when it is utterly false; and therefore not to be depended on as a certain *proof*. I'll give one *Example* to make the foregoing directions the more intelligible; which shall be one of the preceding sums set down again here, viz. the second foregoing.

$$\begin{array}{c} 3 \\ 8 \text{ X } 6 \\ 3 \end{array}$$

56071592 *Multiplicand*
123 *Multiplier.*

6896805816 *Product.*

Here, after having made the *cross*, thus: X
I begin at the Multiplicand, its no matter at which end; but I'll begin towards the left hand, saying, 5 and 6 is 11, I cast away 9, and there rests 2, and 2 and 7 is 9, and there rests nothing; then 8 X 1 and 5 is 6, (I miss the 9) and 2 is 8, which I set on the left of the *cross*, as it appears in the margin. G 3 Then

Then going to the Multiplier, I say, 1 and 3 is 3, and 3 is 6, which I place on the right.

8 $\begin{array}{r} \text{X} \\ 6 \end{array}$ Then multiply one by the other saying, 8 times 6 is 48, I cast away 5 nines out of it, and there remains 3, which I put on the top.

3
8 $\begin{array}{r} \text{X} \\ 6 \end{array}$ as you see in the margin. After the same manner I cast away the nines out of the product, and at the last there remains 3 likewise, and so the work is done.

Note, That the figures on each side of the cross, being multiplied, make 48, and if you add them two figures together as they stand, and cast away the nines, the remainder will be the same; that instead of saying, how many nines is in 48? you say, 8 and 4 is 12; the nines in 12, once, and there remains 3 as before.

IX. The greatest difficulty in Multiplication is, when there is a cypher, or cyphers intermixt with the figures. In such cases, only remember what was said before, in the VIIth Rule, to move for every figure, or cypher, one place toward the left hand, and to take care that each first figure of the several products stand directly under its respective Multiplier; an Example will make it easy to be understood.

Let it be required to multiply 50710984, by 4050607, having set the numbers down as before directed, with a line under them, they stand thus.

50710984 Multiplicand.
4050607 Multiplier.

$$\begin{array}{r}
 354976888 \\
 3042659040 \\
 2535549200 \\
 2028439360 \\
 \hline
 205410266767288
 \end{array}$$

Here

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Here I begin, saying, 7 times 4 is 28, &c. and so go through the Multiplicand by 7, and find its Product 354976888; then I come to a cypher, which I set down under the second figure of the above-mentioned Product, viz. 8, then I multiply the Multiplicand by the next figure of the Multiplier, viz. (6 in the same line) saying, 6 times 4 is 24: I set down 4 next to the cypher, in the same line, and it stands under the third figure in the last product, just under its Multiplier 6, and I find this product, or line, to be 3042659040. Then coming to another cypher, I set it down just under its own place, and go forward with the next figure 5, in the same line as before, saying, 5 times 4 is 20, &c. I set down the 0, just under 5 the Multiplier, and find this product to be 2535549200. Then I come to another cypher, and proceed as before, and find this last line or product, 2028439360. All which products being added together, make 205410266767288, for answer. See the foregoing work.

More Examples.

7864371	327586
20604	6030
31457484	9827580
471862260	19655160
157287420	
	1975343580
162037500084	

X. When there is a cypher, or cyphers, in the Multiplier towards the right hand, then set it, or them, backward from the place of units; towards the right hand and multiply by the significant figure, or figures, as usual; and afterwards annex the cypher, or cyphers, to the general product on the right hand, as in the following Examples.

Examples,

Examples.

$$\begin{array}{r} 326 \\ 20 \\ \hline \end{array}$$

$$\begin{array}{r} 6520 \\ \hline \end{array}$$

$$\begin{array}{r} 4762 \\ 70 \\ \hline \end{array}$$

$$\begin{array}{r} 333340 \\ \hline \end{array}$$

$$\begin{array}{r} 4796 \\ 400 \\ \hline \end{array}$$

$$\begin{array}{r} 1918400 \\ \hline \end{array}$$

$$\begin{array}{r} 746094 \\ 3600 \\ \hline \end{array}$$

$$\begin{array}{r} 4476564 \\ 2238282 \\ \hline 2685937400 \\ \hline \end{array}$$

$$\begin{array}{r} 729764 \\ 476000 \\ \hline \end{array}$$

$$\begin{array}{r} 4378584 \\ 5108348 \\ 2919056 \\ \hline 347367664000 \\ \hline \end{array}$$

XI. When there are cyphers both in the Multiplier and Multiplier, then omit the cyphers in both, till you have multiplied by the significant figures; and then join the cyphers in each to the product, as in these.

Examples.

$$\begin{array}{r} 42600 \\ 220 \\ \hline \end{array}$$

$$\begin{array}{r} 852 \\ 825 \\ \hline \end{array}$$

$$\begin{array}{r} 9372000 \\ \hline \end{array}$$

$$\begin{array}{r} 423000 \\ 5600 \\ \hline \end{array}$$

$$\begin{array}{r} 2538 \\ 2115 \\ \hline \end{array}$$

$$\begin{array}{r} 2368800000 \\ \hline \end{array}$$

$$\begin{array}{r} 376400 \\ 2400 \\ \hline \end{array}$$

$$\begin{array}{r} 15056 \\ 7528 \\ \hline \end{array}$$

$$\begin{array}{r} 903360000 \\ \hline \end{array}$$
CONTRACTIONS.

Or, how to multiply by 10, 100, 1000, 10000, &c.

To multiply $\left\{ \begin{array}{l} 10 \\ 100 \\ 1000 \\ 10000 \\ 100000 \end{array} \right\}$ Add to the Multiplicand $\left\{ \begin{array}{l} 0 \\ 00 \\ 000 \\ 0000 \\ 00000 \end{array} \right\}$

Example

Example.

$$\begin{array}{l}
 428 \\
 \text{Multiply'd} \\
 \text{by}
 \end{array}
 \left\{ \begin{array}{l} 10 \\ 100 \\ 1000 \\ 10000 \\ 100000 \end{array} \right\} \text{ makes } \left\{ \begin{array}{l} 4280 \\ 42800 \\ 428000 \\ 4280000 \\ 42800000 \end{array} \right\}$$

If you would be expeditious and dextrous in *Accounts*, always so multiply by 11 and 12, that the product may be in one line only.

Examples.

$$\begin{array}{r}
 \text{Multiply } 456 \\
 \quad 11 \\
 \hline
 \text{Product } 5016
 \end{array}
 \qquad
 \begin{array}{r}
 7890 \\
 \quad 11 \\
 \hline
 86790
 \end{array}
 \qquad
 \begin{array}{r}
 3425 \\
 \quad 11 \\
 \hline
 37675
 \end{array}$$

In the first of these, I say, 11 times 6 is 66, 6 and go 6; and 11 times 5 is 55, and 6 is 61, 1 and go 6; and 11 times 4 is 44, and 6 is 50, as above; and so of the rest.

$$\begin{array}{r}
 \text{Multiply } 1234 \\
 \quad 12 \\
 \hline
 \text{Product } 14808
 \end{array}
 \qquad
 \begin{array}{r}
 56789 \\
 \quad 12 \\
 \hline
 681468
 \end{array}
 \qquad
 \begin{array}{r}
 30762 \\
 \quad 12 \\
 \hline
 369144
 \end{array}$$

Here I say, 12 times 4 is 48, 8 and carry 4; and 2 times 3 is 36, and 4 is 40, 0 and go 4, &c.

When any number is to be multiplied by 5, it may be contracted by annexing a cypher to the number, and then half it, because 5 is the $\frac{1}{2}$ of 10.

And the rule holds good for brevity if a number is to be multiplied by 15. *Example*, Multiply 567 by 15.

$$\begin{array}{r}
 5670 \\
 \hline
 \frac{1}{2} 2835 \\
 \text{By } \quad 3 \text{ because } 3 \text{ times } 5 \text{ is } 15. \\
 \hline
 8505
 \end{array}$$

When

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When you multiply by any of these compound numbers, viz. 110, 120, 1100, or 1200, then multiply as before, and annex the cyphers afterwards.

Example.

Mult.	3762	34567	46972	96796
	110	120	1100	1200
Prod.	413820	4148040	51669200	116155200

Which way of multiplying is much better than the following.

3762	Or thus,	34567
110		120
37620		691340
3762		34567
413820		4148040

XII. To multiply by article numbers, viz. 13, 15, &c. to 20, to have the work in one line.

Examples.

74974	45678
13	18
974662	822204
Or thus,	
74974	45678
224972	365424
974662	822204

RULE for the first two Examples.

Multiply each figure in the Multiplicand by the unit figure of the Multiplier, adding to each single product its back figure; and to the last figure add what you carry.

As in the first Example, I say, 3 times 4 is 12, 2 and go 1; and 3 times 7 is 21, and 1 carried is 22, and 2, the back figure of the Multiplicand, is 26, 6 and go 2; and 3 times 9 is 27, and 2 is 29, and 7, the back figure, is 36, 6 and go 3; and 3 times 4 is 12, and 3 is 15, and 9, the back figure, makes 24, 4 and carry 2; then 3 times 7 is 21, and 2 is 23, and 4 the back figure, is 27, 7 and go 2, which 2 add to the last figure, 7, and it makes 9, as in the work.

In the two last examples, I multiply by the unit figure of the Multiplier, and set the first figure of the Product one place forward to the right hand.

XIII. To multiply by a *mixt number*; that is a whole number joined with a *Fraction*, whether it be $\frac{1}{2}$, $\frac{3}{4}$, $\frac{1}{3}$, or $\frac{2}{3}$.

The RULE.

When you have multiply'd by the whole number, take the $\frac{1}{2}$, the $\frac{1}{3}$, the $\frac{1}{4}$, the $\frac{2}{3}$, or the $\frac{3}{4}$, of the Multiplicand, and add it to the Product, and that total shall be the whole Product, as in the following examples.

Example 1.

276 Barrels of Raisins
each $3\frac{1}{4}$ C. How many Hundred Weight?

828 the Product by 3.

69 the 4th Part of the Multiplicand, 276.

Ans. 897 Hundreds Weight in all.

Example

Example 2.

In 756 Pieces of *Stuffs*,
Each $24\frac{1}{2}$ Yards, How many Yards?

3024

1512

378 The half of the *Multiplicand*, 756

Answ. 18522 Yards in all.

Example 3.

In 63 Fodder of Lead,
Each $19\frac{1}{2}$ C. How many hundreds?

567

63

$31\frac{1}{2}$ the half of 63, the *Multiplicand*.

Answ. $1228\frac{1}{2}$ hundreds weight in all.

If the Multiplier had been accounted money, at 19s. 6d. and the *Multiplicand* 63 Integers, at that Price then the Product would have been 1228 s. 6d. or 61l. 8s. 6d.

Example 4.

In 24 Casks of Tobacco,
Each $2\frac{1}{2}$ C. How many hundreds?

48

12 The half of 24.

6 The 4th part of 24, or half of 12

Answ. 66 hundreds in all.

'T would have been the same, if I had said 24 Pairs of *Stockings*, or any thing else, at 2s. $\frac{1}{2}$, or 2s. 9d. (for 9d. is $\frac{1}{4}$ of a *Shilling*) then the Product would have been 66s. or 3l. 6s.

Example

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Example 5.

At 224 French Crowns,
 $54\frac{1}{2}$ per Crown,

896
1120
74 $\frac{1}{2}$ The $\frac{1}{2}$ of 224 the Multiplicand.

Pence 12170 $\frac{1}{2}$

Example 6.

At 340 Gros of *Past-boards*.
 $7\frac{1}{2}$ d. per Gros, custom.

2380
68 The $\frac{1}{2}$ part of 340

Prod. 2448 Pence.

This method of multiplying by a mixt number, is of excellent use in a multitude of cases, particularly in exchange of money of different nations.

XIV. I shall now shew the excellent use of *Multiplication*, in answering all manner of questions, that ordinarily occur in business; where we have the *price of one thing*, and want to know the *value of many things* at that rate; and shew that it performs the *office*, and answers the *work* of questions in the *Rule of Three Direct*, of that kind; but in a much consider method, and more elegant manner; and that by such easy rules and directions, that any one who understands *Addition of Money*, shall as readily cast up any thing this way, as he shall in a sum in that: For nothing is more required here, than to carry from one denomination to the next, exactly as we do there; and therefore it may be truly said, That this Rule performeth the work of many *Additions*, as was hinted before.

-H

Example

Example.

	<i>s.</i>	<i>d.</i>	
How much is 3 times,	11	9	Multiplicand?
Or 3 yards of cloth, at		3	Multiplier.
11 <i>s.</i> 9 <i>d.</i>			
	1	15	3 Prod. or Ans.

The RULE.

Observe always to multiply the *price* by the *quantity*, and the *product* is the *answer*.

Here I say, 3 times 9 is 27 pence, which is 2*s.* and 3*d.* I set down 3*d.* under the place of pence, and carry the 2*s.* to the shillings; then 3 times 11 is 33, and 2 that I carry is 35*s.* which is 1 *l.* 15*s.* I set down the 15*s.* under the shillings place, and set down the 1 pound a little forward to the left hand; and so the question is answered, and found to amount to 1*l.* 15*s.* 3*d.* as by the work above. Now here is no more difficulty than in *Addition*, it being the same in effect, and altogether as easy.

<i>l.</i>	<i>s.</i>	<i>d.</i>	If 11 <i>s.</i> 9 <i>d.</i> is three times set down as in <i>Addition</i> , and cast up, it will prove the same, as may be seen in the <i>margin</i> ; and is a sure proof of the truth of this method.
	11	9	
	11	9	
	11	9	
1	15	3	

Example 2.

How much is 5 times 7*s.* 4*d.*? or 5 gallons of Brandy, at 7*s.* 4*d.*

	<i>s.</i>	<i>d.</i>	
Multiplicand,	7	4	the price.
Multiplier,		5	the quantity.
Product,	1	16	8 Answer.

Here

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Here I say, 5 times 4 is 20 pence, which is 1s. 8d. I set down 8 and carry 1, just as in *addition of money*, (and nothing more is required to be remembred, let the *example* be what it will) and 5 times 7 is 35s. and 1 I carried is 36s. which is 1l. 16s. I set down the 16s. under the place of shillings, and the 1l. towards the left hand, and the *answer* is 1l. 16s. 8d. as above.

Example 3.

What is 7 times 2 1d? Or 7 stone of Beef.

	s.	d.	
At	—	1	9 Price.
		7	Quantity.
	12	3	

Here I say, 7 times 9 is 63d. that is 5s. 3d. set down 3, and carry 5, and 7 times 1 is 7, and 5 is 12; which makes 12s. 3d. for the answer.

Example 4.

What comes 9lb. of Tea to, at 9s. 9d. $\frac{1}{2}$ per pound?

l.	s.	d.	q.
	9	9	$\frac{1}{2}$
		9	
4	8	1	$\frac{1}{2}$

I say here, 9 times 2 is 18, 18 farthings is 4d. $\frac{1}{2}$. I set down $\frac{1}{2}$, and carry 4; then 9 times 9 is 81, and 4 I carry is 85 pence, which is 7s. 1d. I set down 1, and carry 7; then 9 times 9 is 81, and 7 is 88 shillings, which make 4l. 8s. I set down 8s. and the 4l. out to the left hand, as before; and the *Answer* is 4l. 8s. 1d. $\frac{1}{2}$, above.

Example 5.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
What comes 10 times		11	6
Or, 10lb. of Nutmegs, at 11s. 6d.			10
	5	15	0

Here 10 times 6 is 60 pence, which is just 5s. I set down 0, and carry 5. then 10 times 11 is 110, and is 11s 5 shillings, which is 5l. 15s. for the Answer.

Example 6.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
How much is 11 times	—		17
Or 11 Pistoles at ditto?	—	—	—
	1	9	12

I say here, 11 times 6 is 66 pence, which is 5s 6d. I set down 6 and carry 5; then 11 times 7 is 77, and 5 that I carry is 82, I set down 2 and carry 8; then 11 times 1 is 11, and 8 is 19; and as they are many *Angels* (it being in the tens of shillings) I take the half of them which is 9, or 9 pounds, and 10 shillings over, which I put to the left of the 2s. I set down before, and they make 12s. and the 9l. I set a proper distance towards the left hand, as in the Example may be seen.

Example 7.

	<i>s.</i>	<i>d.</i>
What comes 12 Sheep to, at	13	4
		12
	1	8. 00 0

Now

Note, 'Tis best to multiply the shillings as simple numbers for every 10 carrying 1, &c. and then to halve the tens of Shillings, which half is always so many pounds: and if they halve even, set down a cypher in the tens of shillings place; but if odd, then set down a 1 in that place, instances of both may be observed in the two last sums.

In the last sum I said, 12 times 4 is 48 pence, or 4s. set down 0, and carry 4; then 3 times 12 is 36, and is 40; I set down 0, and carry 4 for 4 tens; then 2 times 1 is 12, and 4 is 16, the half of 16 is 8, which is 8 pounds for *Answer*, as in the work.

Some more examples.

	l.	s.	d.
9lb. of Cinnamon, at		7	2
			9

Answ.	3	04	6

3C. of Sugar, at	44	4
		8

Here the $\frac{1}{2}$ of 35 is 17 and $\frac{1}{2}$	17	14	8

Pair of Stockings, at 9s. 8d. per pair	9	8
		12

3C. of Hops, at	5	16	0
	3	6	9
			7

Answ.	23	07	3

11 Ounces of Silver, at — — — — —

	l.	s.	d.
	0	5	5

Answ. 3 0 0

10 Pipes of Wine, at per pipe

24	15	0
		10

Answer 247 10 0

6 Yards of Flannel, at

	1	2
		6

Answer 7 0

9 C. of Tallow, at — — — — —

	34	6
		9

Here the $\frac{1}{2}$ of 31 is 15 and a $\frac{1}{2}$ 15 10 6

XV. When the quantity exceeds 12, find numbers in the *Multiplication-Table*, which being multiplied together, will make the quantity: Then multiply the *Price* by one of the numbers, (it matters not which you multiply first by) and then the product will be the answer.

Example 1.

What is 18 times 4 6 Or 18
gallons of brandy at 3 the 1 Multiplier.
4s. 6d. per gallon.

13 6 the 1st Prod. by
6 the 2d Multiplier

Answer 4 01 0 the last Prod. by

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Here I find this quantity two ways (as many times it happens) viz. either by 3 and by 6, or by 2 and by 9; either of them multiplied together make the quantity, viz. 18.

<i>l.</i>	<i>s.</i>	<i>d.</i>
	4	6
		2
	9	0
		9
4	1	0

Here is the answer produced by 2 and 9, as above.

Example 2.

How much is 32 times
Or, 32lb. of Tea, at 15s.
9d. $\frac{1}{2}$ per pound.

The first Prod. by 4,
The 2d Multiplier

	15	9	$\frac{1}{2}$
			4
3	03	2	
		8	
Answer	25	05	4

Here the numbers are 4 and 8; 4 times 8 making 32 the quantity; wherefore I begin and say, 4 times 2 is 8 farthings, which being just two pence, I carry it to the pence; then 4 times 9 is 36, and 2 is 38 pence, which is 3s. and 2d. I set down 2 and carry 3s. &c. After I have multiplied by 4, I find that product to be 3l. 3s. 2d. which I multiply by 8, the other number, and find the last product or answer, to be 25l. 5s. 4d. as in the work may be seen.

What

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What is 120 times,
Or, is 120 quarters of
Corn, at 19s. 8d. per
quarter?

l.	s.	d.
	19	8
		10
9	16	8
		12

Answer 118 00 0

Here 10 times 12 makes 120 the quantity; wherefore I multiply first by 10, and that product is 9l. 16s. 8d. which I multiply by the other number 12, and that produces 118l. for the answer.

77C. of *Madder*, at

l.	s.	d.
3	15	6
		7
26	08	6
		11

Answer 290 13 6

Here 11 times 7 makes the quantity; when I come to multiply by the second Multiplier; viz. 11, I say 11 times 6 is 66, which is 5s. 6d. I set down 6 and carry 5; then 11 times 8 is 88, and 5 is 93s. which is 4l. 13s. I set down 13 and carry 4; then 11 times 6 is 66, and 4 is 70, I set 0, and carry 7 for the seven tens; then 11 times 2 is 22, and 7 is 29, &c.

More examples.

15 Yards of *Ribbon*, at

l.	s.	d.
	2	1
		3
	6	3
		5

Here 3 times 5 is 15, the quantity

Ans. 1 11 3

21 Yards

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21 Yards of *Tabby*, at

l.	s.	d.
	5	11
		7

Here 7 times 3 is 21

2	01	5
		3

Answer 6 04 3

72 Gallons of *Wine*, at

	5	4
		6

Here 6 times 12 makes the Quantity, or 8 times 9 makes 72 likewise.

1	12	0
		12

Answer 19 04 0

81lb. of *Nutmegs*, at

l.	s.	d.	q.
	12	3	$\frac{1}{2}$
			9

Here 9 times 9 makes the Quantity.

5	10	9	$\frac{1}{2}$
			9

Answer 49 17 3 $\frac{3}{4}$

XVI. When the quantity is such a number, that no two numbers in the table can be found to answer it, then multiply by two such numbers as come nearest to the number given, as before; and for the number wanting, to make up the number given, multiply the price of one by the number that is wanting, and add it to the other Product, and the total will be the answer.

Example

Example 1.

39C. of Currants, at per C.

l.	s.
2	13

16	01
----	----

The price 2l. 13s. 6d. }
multiplied by 3

96	06
8	00

Answer 104 06

Here I find the two numbers that come the nearest, are 6 times 6, by which I multiply as before, and the last Product is 96l. 6s. 0d. but 6 times 6 is but 36, and the Quantity is 39, so that there is 3C. wanting; wherefore I multiply the price 2l. 13s. 6d. by 3 and it produces 8l. 00s. 6d. to be added to the last Product, 96l. 06s. 0d. which together make 104 06s. 6d. for the Answer.

79 Firkins of Butter, at

l.	s.
00	17

6	02
---	----

Here the two numbers that come nearest, are 7 times 11, which is 77.

The price multiplied by (2) that }
are wanting.

67	07
01	15

Answer 69 02

Mer

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More Examples.

57 Gros of Pipes, at per Gros

l.	s.	d.
	1	4
		7

09	4	8
----	---	---

1 Gros wanting,

03	14	8
00	01	4

Ans. 03 16 0

76C. $\frac{1}{4}$ of Ship-Basket, at

l.	s.	d.	q.
	13	6	
		6	

4	01	0
		12

The price multiplied by 4.

48	12	0
----	----	---

The $\frac{1}{2}$ of 13s. 6d. for the $\frac{1}{2}$ C.

02	14	0
----	----	---

The $\frac{1}{4}$ of ditto, for the $\frac{1}{4}$ C.

00	6	9
00	3	4 $\frac{1}{2}$

Ans. 51 16 1 $\frac{1}{2}$

87 Ells of Holland, at

Here 7 times 12 is 84, and 3 is 87

3	5	$\frac{1}{2}$
		7

1	04	2 $\frac{1}{2}$
		12

The price multiplied by 3.

14	10	6
	10	4 $\frac{1}{2}$

Ans. 15 00 10 $\frac{1}{2}$

If

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If I had multiplied by 11 times 8, which is 88, and subtracted the price of 1 from the Product, the remainder would have been the answer, as before.

97*G.* $\frac{1}{2}$ of *Cheese*, at per *G.*

l.	s.	d.
	25	6

10	04	0
----	----	---

122	08	0
1	05	0
	12	0

For the 1*G.* wanting.

The half of the Price for the $\frac{1}{2}$ *G.*

Answ. 124 06

Thus by the various *Examples* foregoing, is manifestly seen, that when the price of one thing is given the price of many (at the same rate) may be found by *Multiplication* only; and sooner, and much handsomer than by the *Rule of Three*.

Large sums may be cast up this way, as well as small, observing the *Directions* following.

When your sum is 1, 2, 3, 4, or more hundred always multiply the price by 10, and then that Product by 10 also, which produces the value of one hundred; then multiply that Product by the number of hundreds, whether 2, 3, 4, or 5, &c. and that Product is the value of so many hundreds as there are; then for the tens, whether 20, 30, 40, &c. multiply that Product which gives the price of 10, either by 3, 4, or 5, as the tens shall happen, which place under the last Product, without drawing a line; and for the units always multiply the price by them, whether 3, 4, &c. and set that also just under the former Products, so that you will have three lines to add together, and the total of them is always the answer. *Example*, or two, will make it easy to be understood.

Example

Example 1.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
What is 648 times		4	6	
648lb. of Indigo, at ditto?			10	
The value of (10)	2	05	0	
			10	
The value of (100)	22	10	0	
The number of hundreds			6	
The value of (600)	135	00	0	600
The price of (10) mult. by (4)	9	00	0	40
The price multiplied by (8)	1	16	0	8
Ans ^w .	145	16	0	648

First I multiply 4s. 6d. the price, by 10, and that produces 2l. 5s. for the price of 10; also I multiply the said 2l. 5s. the price of 10, by 10 again, and that produces 22l. 10s. for the value of 100, then I multiply the value of 100, by 6, the number of hundreds, and that product is the value of 600, being 135l. 0s. wherefore I am now only to find out the value of 48: For the four tens in 48, I multiply the price of 10, viz. 2l. 05s. 0d. by 4, and that product shews the value of 40, which is 9l. Then for the 8 units in the 48, I multiply the first price, viz. 4s. 6d. and that product gives the value of 8, which is 1l. 16s. which being added together, (that is only the three lines that have no line of separation between them) make 145l. 16s. 0d. for answer.

And thus may any sum be done, let it be as large as it will, only when the sum consists of thousands, you have 4 lines to add together, but when of hundreds, but three.

I

Example

Example 2.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
355 ells of Holland, at		2	$3\frac{1}{2}$ 10
The value of (10)	1	02	11 10
The value of (100)	11	09	2 3
The value of (300)	34	07	6
The value of 10 mult. by (5)	5	14	7
The price by 5 units	0	11	$5\frac{1}{2}$
Ans.	40	13	$6\frac{1}{2}$

Example 3.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
966lb of Bohea Tea, at		14	5 10
The value of (10)	7	04	2 10
Ditto of (100)	72	01	8
The number of hundreds			9
The value of (900)	648	15	0
The value of 10 mult. by (6)	43	05	0
The price of 1 mult. by (6)	4	06	6
Answer	696	06	6

Example

Example 4.

954 Gall. of Rum, at	l.	s.	d.	
		03	5	
			10	
The price of (10)	1	14	2	
			10	
The price of (100)	17	01	8	
			10	
The price of (1000)	170	16	8	
The number of thousands			8	
The value of (8000)	1366	13	4	8000
The value of (100) m. by 9,	153	15	0	900
The value of (10) m. by 5,	8	10	10	50
The price mult. by 4 units,	0	13	8	4
Answer	1529	12	10	8954

I have insisted the longer on this excellent method, that might it be well understood ; not only for its elegant, expeditious, and facile dispatch of ordinary Affairs ; but for its utility in contracting many operations in other rules, as the *Rule of Three*, &c.

I know it is not customary to introduce any thing of this kind to be learnt so early ; imagining (it may be) the Scholar not capable of understanding them, till he has made farther advances in *Arithmetic* ; but since they are only *Multiplication*, the foregoing methods properly belong to the *Rule*, and may well be taught in it, especially since they are of such excellent use in all manner of business, and may be of service to some, whose leisure or ability admit of no larger improvements in *Arithmetic*.

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Quantities of weight, measure, &c. are expeditiously found by this method of multiplying by component parts.

Examples.

In 64 barrels of *Anchovies*, each
how many pounds? Multiply by $30\frac{1}{2}$ lb.
8 and 8

Ans. 1952

In 56 firkins of *Butter*, each
how many pounds? Multiply by 56 lb.
7 and 8

Ans. 3136

6. qrs. lb.

In 98 casks of *Capers*, each
how many hundreds, &c? 3 3 14
10, 9, and 8

Ans. 379 3 0

In 104 bars of *Spanish Silver*, each
how many Oz? 46 $\frac{1}{2}$ Oz.
10, 10 and 4

Ans. 4810 Ounces

In 48 packs of *Linen*, each
how many Ells Flemish? Mult. by 4225 Ells Flemish
6 and 8

Ans. 201800

I might here also shew the method of *Cross Multiplication*; or multiplying *shillings* and *pence*, by *shillings* and *pence*; or *feet* and *inches*, by *feet* and *inches* (it being all one) and some other methods in *Practical Multiplication*; but there being too much of *Division* used with them, I shall defer them till I come to another place.

CHAP.

CHAP. V.

DIVISION.

I S a *Rule*, by which we discover how often one number is contained in another; as if it were asked, How often is 8 contained in 48; the answer would be 6 times. It likewise serveth to bring small denominations into greater; as *Farthings* into *Pounds*, and *Pounds Weight* into *Tuns Weight*, etc.

II. This *Rule* is comprehended under three certain branches, and one uncertain, viz.

1. The *Dividend*, or number given to be divided.
2. The *Divisor*, or number given to divide by.
3. The *Quotient*, or number of equal parts, shewing how often the *Divisor* is contained in the *Dividend*.
4. The *Remainder* after the work is ended; which is always of the same name or quality with the *Dividend*; and must be less than the *Divisor*, if the work be right: And this is the uncertain branch, because there is sometimes a *Remainder*, and sometimes not.

III. *Division* is either single or compound: Single, when the *Divisor* consisteth of one figure only, and the *Dividend* of two at the least. Any thing of this kind is answered by the *Multiplication-Table*; as if 54 were to be divided by 6, the answer would be 9. For 6 is contained 9 times in 54: Here 54 is the *Dividend*; 6 the *Divisor*; and 9 is the *Quotient*, or answer;

IV. *Compound Division* is when the *Dividend* consisteth of many places or figures, and the *Divisor* of one or more figures. As if 365, the days in a year were to be divided by 7, the days in a week; 365 is the *Dividend*; 7 the *Divisor*, 52 the *Quotient*, and 1 the *Remainder*.

$$\begin{array}{r}
 \text{Dividend.} \\
 \text{Divisor } 7 \overline{) 365} \text{ } 52 \text{ Quotient} \\
 \underline{35} \\
 15 \\
 \underline{14} \\
 1
 \end{array}$$

1 Remainder.

A General RULE for the Working.

N. B. $\left\{ \begin{array}{l} 1 \text{ Seek,} \\ 2 \text{ Multiply,} \\ 3 \text{ Subtract.} \end{array} \right.$

This *Rule* comprehends three of those foregoing; and is accounted the hardest lesson of *Arithmetic*; but I shall, by plain *Rules*, and familiar *Examples*, render it easy to the meanest capacity. And as in *Multiplication*, so in this *Rule*, I shall endeavour at some new improvements; discovering that many things in this *Rule* may be abridged, and shew its excellent use in answering many questions, which seem to require a more progressive knowlege in *Arithmetic*.

Example 1.

Let it be required to divide 7420 by 5; in order to which, I place my *Dividend*, or sum to be divided, into 4 equal parts, or shares thus, 7 4 2 0. Then I place my *Divisor* 5, before the *Dividend*, with a crooked line before it, and a strait line drawn underneath it thus:

$$\begin{array}{r}
 5 \overline{) 7420}
 \end{array}$$

Then

Then I proceed according to the *Rule*: And first I *seek*, saying, How many times 5, the *Divisor*, can I have in 7, the first figure of the *Dividend*, and the answer is once, which I place under the line just under the 7; then according to the *Rule*, I multiply, saying once 5, (the *Divisor*) is 5; then, as the *Rule* directs, I subtract, saying, 5 from 7, and there remains 2, which are two tens, which I suppose stand before the next figure in the *Dividend* viz. 4, and so makes it 24,

$$\begin{array}{r} 5 \overline{) 7420} \\ \underline{5} \\ 24 \\ \underline{20} \\ 42 \\ \underline{40} \\ 20 \\ \underline{20} \\ 0 \end{array}$$

I

for a new *Dividual*. Then again, I *seek*, saying, How many times 5, (the *Divisor*,) can I have in 24, the *Dividual*? And the answer is 4 times, which I place under the line, just under 4 the second figure in the *Dividend*, then I multiply, saying, 4 times 5 the *Divisor*, is 20, which I subtract from 24, and there rests 4, which being 4 tens, makes the next figure 2, in the *Dividend*, to be 42. Then again I *seek* how many times 5 I can have in 42, and the answer is 8 times, which I put under the line, just under 2, the third figure in the *Dividend*; then I multiply, saying, 8 times 5 is 40, which I subtract from 42, and there remains 2, which 2 tens make the cypher in the *Dividend* to be 20; then I say, how many times 5, the *Divisor*, in 20, and the answer is 4 times; then 4 times 5 (the *Divisor* is 20, from 20, and there remains nothing. And so the work is done; as by the following *example*.

Divisor 5)7420(*Dividend*.

1484 *Quotient*, or answer.

So that I find by the work, that 5 is contained in 7420 just 1484 times: Or if the *Dividend* had been so many *Shillings* or *Pounds* to be parted among 5 persons, each person must have had so many *Shillings* or pounds for his share.

V. When the figure of your *Dividend* is lesser than the *Divisor*, or first figure of your *Divisor*, then make the two first figures of the *Dividend*, your *Dividual*, and work as before.

Example.

Divide 4263 gallons of *Wine* among 7 Persons: Having set down the *Dividend* for the work as before, with the *Divisor* before it, thus,

7)4263(*Dividend.*

609 *Quotient.*

I proceed, saying, How many times 7, (the *Divisor*), can I have in 4, the first figure of the *Dividend*, and knowing I cannot take 7 out of 4, I take it out of 42, the two first figures of the *Dividend*, and the answer is 6 times, which I put just under 2, the second figure of the *Dividend*, and then multiply, saying, 6 times 7, (the *Divisor*), is 42, and there remains nothing. Then the sevens that are in 6 (for you must never take more than one figure or cypher, at a time out of the *Dividend*, except you are obliged to do it at first) I cannot take, wherefore I put a cypher in the *Quotient*, under 6, and the 6 remains as so many tens, and makes the next or last figure in the *Dividend* 3, to be 63, then the sevens in 63, 9 times, and the work is done; and the *Quotient* is 609, or 609 gallons for each man's share.

The Proof.

To prove this, or any other sum in *Division*, multiply the *Quotient*, by the *Divisor*, and if the *Product* is like the *Dividend*, the work is right: But observe whenever there is a *Remainder*, such *Remainder* must be taken in, or added to the *Product*.

Example

Example.

$$\begin{array}{r} 7 \overline{)4263} \\ \underline{} \end{array}$$

$$\begin{array}{r} 609 \\ \underline{} \end{array}$$

$$\begin{array}{r} 7 \\ \underline{} \end{array}$$

$$\begin{array}{r} 4263 \text{ Proof.} \\ \underline{} \end{array}$$

Here I say, 7 times 9 is 63, and carry 6, then 7 times 0 is nothing, but 6 is 6; lastly, 7 times 6 is 42; so that I find this *Product* to be the very same figures with the *Dividend*; therefore the work is right.

So likewise as *Multiplication* proves *Division*, doth *Division* prove *Multiplication*. For if you divide the *Product* by the *Multiplier*, the *Quotient* (if the work is right) will be the same with the *Multiplicand*: As thus:

In proving the last Sum, 609 is the *Multiplicand*, and 4263 is the *Product*, and 7 the *Multiplier*. Now if the *Product* 4263 be divided by 7 the *Multiplier*, the *Quotient* will be 609 the *Multiplicand*, as may be seen in the foregoing work.

Example

Divide 97961 Pieces of 8 among 9 Men.

$$\begin{array}{r} 9 \overline{)97961} \\ \underline{} \end{array}$$

$$\begin{array}{r} 10884\frac{1}{9} \text{ Answ.} \\ \underline{} \end{array}$$

$$\begin{array}{r} 9 \\ \underline{} \end{array}$$

$$\begin{array}{r} 97961 \text{ Proof.} \\ \underline{} \end{array}$$

Here

Here I say, the nines in 9, once; which I put under the line, just under 9 in the *Dividend*, and then I multiply, saying, once 9 from 9, and there remains nothing, then the nines in 7, none; wherefore I set down an 0 in the *Quotient*, just under 7, and the 7 remains, and makes the next figure 9 in the *Dividend*, to be 79; then the nines in 79, are 8, then 8 times 9 is 72, from 79, and there rests 7, which makes the next figure 6, in the *Dividend*, to be 76; then the nines in 76 are 8; 8 times 9 is 72, from 76, and there rests 4, which makes the next and last figure in the *Dividend* to be 41; then the nines in 41 are 4; 4 times 9 is 36, from 41, and there rests 5, which is the *Remainder*; and may be set at some small Distance from the *Quotient*, towards the right hand, with the *Divisor* 9 under it, thus $\frac{5}{9}$. So that there are 5 parts of 9 over, besides 10884, that comes to each man's share, and is called a *Fraction*, and signifies, that each person ought to have 5 ninths of a piece of eight more to his share.

What hath been already said for instruction, to divide by a single figure, I think sufficient to any intelligent person; and therefore shall only add some *Examples* for the learner's practice, and so proceed forward in the rule.

Examples for practice.

Divisor	6)9654	7)4702	5)44044	
Quotient	1609	671 $\frac{6}{7}$	8808 $\frac{4}{5}$	Rem
	4)57802	9)345678	6)40706	
	14450 $\frac{2}{4}$	38408 $\frac{6}{9}$	6784 $\frac{2}{6}$	
			Divi	

Divisor $7)89012$

$8)98765$

$9)4567097$

Quot. 12716
 7

$12345 \frac{1}{4}$
 8

$507455 \frac{2}{9}$
 9

Proof, 89012

98765

4567097

Note, There can be no shorter way, nor a more regular method of dividing by a single figure, than by the Examples foregoing.

As in *Multiplication*, we multiply by 11 and 12 at once, to have the Product in one line, so in this rule 'tis most expeditious and commendable to divide by the above mentioned numbers, as by a single figure, as in the following *Examples*.

By $11)45678$

$11)379600$

Quoti. $4152 \frac{6}{11}$

$34509 \frac{1}{11}$

By $12)42697$

$12)3967040$

Quoti. $3558 \frac{1}{12}$
 12

$330586 \frac{8}{12}$
 12

Proof, 42697

3967040

In the first *Example* I say, The elevens in 45, 4 times; the elevens in 16, once; the elevens in 57, 5 times; the elevens in 28 twice, and there remains 6; and the *Quotient* is 4152; as by the *Example*.

In the third *Example*, where I divide by 12, I say the twelves in 42, 3 times; the twelves in 66, 5 times; the twelves in 97, 8 times, and there remains 1; and the *Quotient* is 3558; as by the *Example*.

In

In like manner you may divide by these numbers, viz. 110, 120, 1100, or 1200, &c. cutting off the cypher or cyphers, with a downright stroke of the pen; and also as many figures, or cyphers, towards the right hand, in the *Dividend*, which will be the remainder, or part of it, as in the following

*Examples.*Divide by $11|0)8097|4$

Quotient $\begin{array}{r} 736 \cancel{110} \\ 110 \end{array}$

Proof $\begin{array}{r} 80974 \end{array}$

Divide by $12|00)2880|00$

Quotient $\begin{array}{r} 240 \end{array}$

VI. *Contractions*, or how to divide by 10, 100, 1000, or 10000, &c. So many cyphers as you have in your *Divisor*, cut off with a stroke so many figures, or cyphers, from your *Dividend*, from the right hand towards the left; and the work is done. The figures on the left hand of the stroke is the *Quotient*; and those on the right the *Remainder*; as in these *Examples*.

Q. R.
 $1|0)36|5$

10

Q. R.
 $1|00)749|60$

100

Q. R.
 $1|000)567|800$

1000

Quot.

$1|0000)7496|4600$ Remains.

VII. When the *Divisor* consists of several figures then arises the greatest difficulty in the work of *Division*; but I shall give such plain directions, which if heedfully attended, and observed, will render it very easy.

Example

Example 1.

Let it be required to divide 78901 by 32. In order to the work, I place the numbers down with two hooked lines, one behind the *Divisor*, and the other before the *Quotient*; thus:

Divid. Quotient.
Divisor 32)78901(.....

Then I set out as many figures towards the left end of the *Dividend*, as there are places in the *Divisor*, by making a *Point* under 8, as above; then remembering the *General Rule*, viz. to seek, multiply and subtract, I begin saying, how many times 3, the first figure of the *Divisor*, can I have in 7, the first figure in the *Dividend*, and the answer is twice; wherefore I set down 2 in the *Quotient*, thus, 32)78901(2. Then according to rule, I multiply the *Divisor*, 32, by 2, the times I take, saying, twice 2 is 4, which I set down under 8 in the *Dividend*; then twice 3 is 6, which I place under 7 in the *Dividend*; then I draw a line, and, according to the rule, subtract 64 from 78, and there remains 14: as in the first step of the work may be seen, standing thus:

$$\begin{array}{r} 32)78901(2 \\ \underline{64} \\ 14 \end{array}$$

Then I make a *Point* under the next figure, to wit, 9, and bring it down, setting it on the right hand of the *Remainder* 14; and then there is 149 for a new *Dividend*, and stands thus:

K

$$32)78901(2$$

$$32 \overline{) 78901} (2$$

$$\begin{array}{r} 64 \\ \hline \end{array}$$

$$149$$

Then again I seek how oft I can have 32, the *Divisor*, in 149 the *Dividual*; but since that is too hard to reach by the mind, there being one figure more in the *Dividual* than in the *Divisor* (for there never ought to be more than one) I seek how often I can have 3, the first figure of the *Divisor*, in 14, the two first figures in the *Dividual*, and I find I can have 4 times; wherefore I put 4 in the *Quotient*, and multiply the *Divisor*, 32, by 4, the figure placed in the *Quotient*, saying, 4 times 2 is 8, which I set under 9, then 4 times 3 is 12, which I put under 14, and then subtract 128 from 149, and there remains 21; (Note After any *Subtraction*, there must never remain so much as the *Divisor*, for if there doth, you have made an error, by taking a time too little, which must be rectified before you proceed any further) then I make a point under the next place in the Dividend, which is cypher, and bringing it down, set it on the right of the remainder 21, and it makes 210, for a *Dividend*; and after this second step, the work stands thus;

$$32 \overline{) 78901} (24$$

$$\begin{array}{r} 64 \\ \hline \end{array}$$

$$149$$

$$128$$

$$210$$

Then again I seek how oft I can have 32 the *Divisor* for in 210, or how oft (because there is one figure more in the *Dividual*, than in the *Divisor* I can have 6

the first in the Divisor, out of 21, the two first figures in the Dividual, and the answer is 7 times: But I must observe not to take the first figure any more times than I can the next. Wherefore I try if I can take all the figures 7 times, by multiplying 32 the Divisor, by 7, and note its product on paper, or in my mind, only by observing the two last figures, whether it be not too big to subtract from the Dividual, and I find it is, for I cannot take 224 (the product of 32 by 7) out of 210 the Dividual, wherefore I take a time less, viz. but 6, and put that in the quotient, and say, 6 times 2 is 12, 2 and carry 1, and 6 times 3 is 18, and 1 is 19, and then I have 192 to take out of 210, and there rests 18. Then I make a point under the last figure of the Dividend 1, and bring it down to the remainder 18, and it makes 181, and the work stands thus:

$$32)78901(246$$

$$....$$

$$64$$

$$149$$

$$128$$

$$210$$

$$192$$

$$181$$

Then I seek how often I can have 32, out of 181, or how oft 3 in 18, and the answer is 6 times; but on trial I find that too much; and therefore I take but 5 times, and set 5 in the Quotient, and multiply the Divisor 32 by 5, and find that product is 160, to be subtracted from 181, and the remainder is 21, and so the work is finished, and the Quotient is 2465, and the Remainder 21; which shews that 32 is contained in 78901, 2465 times, and 21 over. *See the work.*

K 2

Dividend

Dividend.

Divisor, 32)78901(2465 Quotient.

64

149

128

210

192

181

160

21 Remainder.

Example 2.

Divide 16790 Days by 365

Quotient.

365)16790(46 Years.

1460

2190

2190

(0)

In the *example* above, I find I cannot take the first figure of the Divisor out of the Dividend ; wherefore I say, How oft 3 in 16 ? Upon trial, I find 5 times too much, wherefore I set down 4 in the Quotient, and say, 4 times 5 is 20, I set down 0 under 9, in the Dividend, and carry 2, saying, 4 times 6 is 24, and 2 is 26, 6 and carry 2 ; then 4 times 3 is 12, and 2 is 14 ; which product of 1460 I subtract out of the Dividend 1679, and there remains 219, to which I set down the cypher out of the Dividend, and it makes 2190 for a Dividend, &c. See the work above.

Example

Example 3.

Divide 345678901 by 2345. In order to the work, set it down thus :

$$2345 \overline{) 345678901}$$

In this Sum are four places in the Divisor, wherefore I make a point under the 4th figure in the Dividend, viz. under 6, for my first Dividual: but if the first figure in the Divisor had been bigger than the first in the Dividend, then I must have made the point under the 5th figure in the Dividend, to wit, under the 7 and then have tried how oft the first figure in the Divisor could have been taken out of the two first figures in the Dividend.

But to proceed, I first seek how oft I can have 2, the first figure of the Divisor, out of 3, the first of the Dividend, which is once, wherefore I put 1 in the Quotient, and multiply the Divisor 2345 by 1, setting the product just under the first Dividual, and subtract according to *Rule*, and then the work stands thus :

$$2345 \overline{) 345678901}$$

$$\begin{array}{r} 2345 \\ \hline 1111 \end{array}$$

Note, You must never bring down more than one figure or cypher at a time out of the Dividend, and for every figure or cypher brought down, there must be one, or a cypher put in the Quotient.

Then I make a *Point* under the next figure in the Dividend, viz. 7, and bring it down, placing it on the right of the remainder 1111, and then I have 11117 for a Dividual, which contains one figure more than the Divisor; wherefore I take the first figure of the

Divisor out of the two first figures of the Dividend viz. 2 out of 11, saying, the two's in 11, 5 times but on trial, I find I cannot take 5 times through the whole Divisor; for when I multiply the Divisor by 5 I find the product to be 11725, which cannot be taken out of 11117, that is, I cannot take 117 out of 111, wherefore I take one less, and set 4 in the Quotient, by which I multiply the Divisor 2345, and find its product 9380 which subtracted from 11117, leaves 1737 for the remainder; to which I bring down the next figure of the Dividend, viz. 8. and annex it on the right hand, and then there is 17378 for a Dividual and the work stands thus:

2345)345678901(14

2345

11117

9380

17378

Then I seek how oft I can have 2 in 17, and the answer is 8 times, but on trial I find it too much; wherefore I set 7 in the Quotient.

Note in general, When you are upon trial for the times you can take, you need only mind the two last figures of the product towards the left hand; for you can take them out of the two first of the Dividual, it will most commonly bear the times you take

Having set 7 in the Quotient, I multiply the Divisor by it, and the product is 16415, which I subtract from 17378, and the remainder is 963; to which I bring down the next figure in the Dividend, viz. 9 and then I have 9639 for a Dividual, and then the work will appear as follows.

2345

2345)345678901(147

....
2345

11117

9380

17378

16415

9639

Here this last Dividual hath an equal number of figures with the Divisor. *viz.* 4; wherefore I seek how often I can have 2, the first figure of the Divisor, out of 9, the first of the Dividual, and the answer is 4 times, which I put in the Quotient, and then multiply the Divisor by it, and the product is 9380, which subtracted from 9639, the remainder is 259, to which I bring down the cypher, the next place in the Dividend, and then I have 2590 for a Dividual; then I seek again, and set 1 in the Quotient, by which I multiply the Divisor, and subtract according to *Rule*, and the remainder is 245, to which I bring down the last figure out of the Dividend: *viz.* 1. and then there is 2451 for the last Dividual, and then I seek again, and I find I can take but once, wherefore I set another 1 in the Quotient, and work as before; and I find the remainder 106, and so the work is finished, as by the whole operation in the following page.

The P R O O F.

To prove the following sum, or any other sums in this *Rule*, multiply the Quotient by the Divisor, and if there be a remainder, it must be taken in as you multiply; and if the product is like the Dividend, the work is right, as may also be seen in the *Example*.

2345)

2345)345678901(

147411

2345

2345

737061

11117

589644

9380

442234

294822

17378

(345678901 Proof.

16415

9639

9380

2590

2345

2451

2345

$$\begin{array}{r} 7 \\ 5 \times 0 \\ 7 \end{array} \left. \vphantom{\begin{array}{r} 7 \\ 5 \times 0 \\ 7 \end{array}} \right\} \text{Proof.}$$

(106) Remainder.

In proving (after I have set the Divisor under the Quotient, as in the *Example*) I say 5 times 1 is 5, and 6 that remains in the units place of the remainder, is 11. 1 and carry 1, &c. When I come to the third figure in the Multiplier, I take in the 1 that stands in the place of hundreds in the remainder, as 3 times 1 is 3, and 1 is 4, &c.

Division may also be proved by the cross, as in *Multiplication*: For trial, let us prove the foregoing sum thus.

First cast the nines out of the Divisor, and there remains 5, which I place on the left of the cross (as you see in the margin) then out of the Quotient, and there remains 0, which I set on the right of the cross; then I multiply these two together, and they make 0; but the nines must have been cast out there also, if by multiplying them together

whether they had made any, and what was over carried to the *remainder*, which here makes 7, which I set on the top, as in the margin. Lastly, I cast away the nines out of the Dividend, and there rests 7 also, which I put underneath the cross, and finding the top and bottom figures to be alike, I conclude the work is right.

The foregoing directions to the preceding *examples*, are so plain and easy, that there is no occasion for any more; so I shall set down some more *examples*, without any verbal directions, thinking what hath been already said to that purpose, to be sufficient.

More Examples.

Divisor 14)5873456(419532 Quotient

.....

$$\begin{array}{r}
 56 \\
 \hline
 27 \\
 14 \\
 \hline
 133 \\
 126 \\
 \hline
 74 \\
 70 \\
 \hline
 45 \\
 42 \\
 \hline
 36 \\
 28 \\
 \hline
 \text{remainder} \quad (8)
 \end{array}$$

47)27072329(576007

.....

$$\begin{array}{r}
 235 \\
 \hline
 357 \\
 329 \\
 \hline
 282 \\
 282 \\
 \hline
 329 \\
 329 \\
 \hline
 \end{array}$$

$$\begin{array}{r}
 5 \\
 2 \overline{) 7} \\
 5 \\
 \hline
 \end{array}$$

(0) *Remainder*

Divisor

Divisor 426)7890123(18521

$$\begin{array}{r}
 3 \overline{) 7890123} \\
 \underline{3630} \\
 3408 \\
 \underline{2221} \\
 2130 \\
 \underline{912} \\
 852 \\
 \underline{603} \\
 426 \\
 \underline{} \\
 (177)
 \end{array}$$

$$\begin{array}{r}
 96)7400900(77092 \\
 \underline{672} \\
 680 \\
 \underline{672} \\
 890 \\
 \underline{864} \\
 260 \\
 \underline{192} \\
 (68)
 \end{array}$$

$$\begin{array}{r}
 2 \overline{) 6X6} \\
 \underline{3}
 \end{array}$$

Here follow some other sums, with their *Quotients* and *Remainders* only: their working being purposely omitted; leaving that to the learner for a trial of his ingenuity.

As if you divide 796976499, by 49654, the *Quotient* will be 16050, and the *Remainder*, after the work is ended, 29799.

Again, if you divide 5345678905, by 765432, the *Quotient* will be 6983, and the *Remainder* 66714.

Also, if you divide 45678901234, by 9876543, the *Quotient* will be 46249, and there will be a *Remainder* of 8775138.

And if you divide 123456789012, by 12345678, there will be for the *Quotient* 1000, and for the *Remainder* 12.

And that nothing may be wanting to a perfect understanding of this *Rule*, I have subjoined the following *general notes concerning Division*.

1st, So many places as are in your *Divisor*, you point off so many in your *Dividend*, for your

Div

Dividual, except the first figure of the Divisor exceed the first of the Dividend, and then you move a place farther towards the right hand, and make your point there; and then your Dividual marked out, hath a figure more than your Divisor; and then you must take the first figure of your Divisor out of the two first figures of your Dividual.

2dly, You never place a cypher in the Quotient the first time you seek.

3dly, The times that you take the Divisor out of the Dividual, never exceed 9.

4thly, The Dividual never exceeds the Divisor above one figure.

5thly, You never bring down but one figure or cypher at a time, out of the Dividend.

6thly, For every figure or cypher brought down from the Dividend, there must be one, or a cypher placed in the Quotient also.

7thly, When you cannot take the Divisor out of the Dividual, you must put a Cypher in the Quotient, and take another figure from the Dividend: And if, again, you cannot take it, place another cypher in the Quotient, and then seek again.

8thly, When, at any time, after you have subtracted, there remains nothing, and yet there remains a cypher, or cyphers in the Dividend, it or them must be put in the Quotient as part of it, and the work is done; and there will be no Remainder.

The short Italian Way of DIVISION.

There is another way of Division shorter than the foregoing, because you omit setting down the several products of your *Multiplication*, but multiply and abstract together; and is like the common *Scratch* or *Cancelling* way of Division, only you are not at the trouble of removing your Divisor every time you seek, as in that way you are.

Example.

Example.

Let us divide the second *Example* in page 100, by this (as it is called) short *Italian way*; viz: Divide 16790 days by 365. In order to the work. I set it down as before, thus:

$$365 \overline{) 16790(46}$$

$$\underline{2190}$$

$$(0)$$

Here I seek (as before) how oft I can have 3 in 10 (my point being under 9, for the Dividual) and I find I can have but 4 times; wherefore I put 4 in the Quotient, and multiply the Divisor (as before) saying, 4 times 5 is 20, but I do not set down 0, and carry 2, as in the other way; for the Product must not be set down, as was said before, but forthwith subtract, saying, 4 times 5 is 20, 20 from 9 I cannot, but 20 from 29, (borrowing two tens) and there remains 9, which I set under the line; then 4 times 6 is 24, and 2 that I borrowed 26, from 7 I cannot, but 26 from 27 and there remains 1, which I also set down; then 4 times 3 is 12, and 2 that I borrowed is 14, from 16 and there remains 2, which I place under the line; then there is a remainder of 219, which I bring down the cypher out of the Dividend, and then I have the last Dividual 2190; then I find the 3's in 21, 6 times, by which I multiply the Divisor, saying 6 times 5 is 30, from 0 I cannot, but 30 from 30 (borrowing 3 tens) and there rests 0; then 6 times 6 is 36, and 3 that I borrowed is 39, from 40 I cannot, but 39 from 39 and there remains 0; then 6 times 3 is 18, and 3 that I borrowed is 21, from 21, and there remains 0; and so the work is done.

L

Let another *example* be this: Divide 345678901 by 2345, which is the third *example* in page 101.

$$2345 \overline{) 345678901}$$

$$\underline{11117}$$

Here I say, once 5 is 5, from 6, and there remains 0, &c. then I bring down the 7, and set 4 in the Quotient, and say, 4 times 5 is 20, from 7 I cannot, but 20 from 27, and there remains 7. Then 4 times 4 is 16, and 2 that I borrowed is 18, from 1 I cannot, but 18 from 21, and there remains 3. Then 4 times 3 is 12, and 2 is 14, from 1 I cannot, but 14 from 21, and there remains 9. Then 4 times 2 is 8, and 2 is 10, from 11, and there remains 1; so that there remains 1737, to which I bring down the next figure 0, for the Dividual, and the work stands thus:

$$2345 \overline{) 345678901} \quad 14$$

$$\underline{11117}$$

$$17378$$

Again, I seek, and put 7 in the Quotient, and say, 7 times 5 is 35, from 8 I cannot, but 35 from 38, and there remains 3. Then 7 times 4 is 28, and 3 that I borrowed is 31, from 7 I cannot, but 31 from 37, and there remains 6. Then 7 times 3 is 21, and 6 that I borrowed is 24, from 3 I cannot, but 24 from 33, and there remains 9. Then 7 times 2 is 14, and 9 that I borrowed is 17, from 17 and there remains 0. Then I bring down the next figure 9, and the work appears thus:

L

2345)

$$2345)345678901(147$$

$$\underline{11117}$$

$$\underline{17378}$$

$$9639$$

Then I bring down the rest of the figures one after another, working as before, till the whole is finished in the following manner.

$$2345)345678901(147411$$

$$.....$$

$$\underline{11117}$$

$$\underline{17378}$$

$$\underline{9639}$$

$$\underline{2590}$$

$$\underline{2451}$$

Remainder (106)

Thus have I explained both the *Italian* ways of Division, leaving it to the learner to use which he likes best. But my method will be to pursue the first *Italian* way thro' the remaining part of this Book, it being very plain and easy to be understood.

There is a very short way of Division (I think the shortest that can be) by cancelling; and so I shall give one *example* to shew its brevity: My design in the book, being not only to shew the most intelligible but the shortest way of working in all the rules.

Example

Example.

Divide 6945407 by 276)694507(25164

First, I seek, and find I can take two times, and twice 6 is 12, from 4 I cannot, but 12 from 14 the 2 being over the point or stop for the first *Dividual*) and there remains 2; then twice 7 is 14, and 1 is 15, from 19, 4; and twice 2 is 4, and 1 is 5, from 6, 1: And then there is 1425 for a new *Dividual*, etc. See the work; the *Quotient* being 25164, and the *Remainder* 143.

VII. When there is a cypher, or cyphers, in the *Divisor*, towards the right hand, you may cut it, or them off, with a downright stroke of the pen, and also do the same with as many figures, or cyphers, to the right of the *Dividend*; and then divide the remaining figures of the *Dividend*, by the remaining figures of the *Divisor*, as if there had been no Cyphers in the *Divisor*, or *Dividend*; and what you cut off from the *Dividend*, is the remainder, or part of it: For what remains after the work is done, must be put to what you cut off from the *Dividend*, for the whole remainder.

Examples.

By the short Italian way.

24|00)7694|06(320

345|000)809230|000(23456

72

1192

49

1573

48

1932

Rem. (1406)

2070

Rem. (0)

For the first of these *examples*, there are two cyphers in the *Divisor*, wherefore I cut off two places from the *Dividend*, and divide 7694 by 24, and there remains 14 at the last; to which I bring down the two places cut off, viz. 06, and annex them to the 14, for the whole remainder, viz. 1406, and the Quotient is 320.

In the second *example*, there are 3 cyphers in the *Divisor*, which I cut off; and also as many in the *Dividend*; and divide by 345; and then the work is done, and there remains nothing.

IX. Any Division sum, when the *Divisor* is such a number that any two digits or numbers in the Multiplication-table being multiplied together, do make it, viz. the *Divisor*, then such sum may be done at two Divisions, or by component parts, much sooner, and in fewer figures than at one.

Examples.

Divide 16560 by 48.

At one Division

48)16560(345

144

216

192

240

240

(0)

At two Divisions, or component

6)16560

(parts.

8)2760

345 Quotient.

Here

Here the two numbers in the table, multiplied together, that make the Divisor, are 6 and 8, for 6 times 8 is 48, the Divisor: Wherefore I divide the Dividend 16560 by 6, and the Quotient is 2760, which I divide by 8, the second number, and the Quotient, by that, is the true Quotient sought, viz. 345, as in the common way.

Bring 1212288 ounces of *Raw Silk*, into pounds of 24 ounces.

At one Division.

24)1212288(50512

....

120

122

120

28

24

48

48

(0)

At two Divisions, or Component

12)1212288

(parts.

2) 101024

50512 Quo. sought.

Here are eleven figures difference between one way and the other.

*More Examples.**At one Division.*

72)488808(6789

432

568

504

640

576

648

648

(0)

By two Divisions, or component parts.

8)488808

9) 61101

6789 *Quotient.*

Here if I had taken 6 and 12 for my Divisors, they would have produced the same Quotient, for 6 times 12 is 72, as well as 8 times 9.

(56 the Divisor

7)18648

8) 2664

333 *Quotient sought.**(99 the Divisor.*

9)537768

11)59752

5432

If there happen to be any remainder, either in the first or second *Division*, or in both, yet the Quotient will be the same. But when there are remainders, the way to find the true remainder, as if you divided at once, is to multiply the first *Divisor*, by the last remainder, taking in the first remainder, if any be.

Of MONEY.

X. Now I shall shew how to divide Pounds, Shillings, and Pence, without reducing them any other-wise than in your mind; and also how this rule answers many questions that seem to require a recourse to the *Rule of Three* for their solution.

Divide 12*l.* 10*s.* 6*d.* among 5 persons.

Divisor 5)12 10 6 *Dividend.*

Each must have 2 10 1 $\frac{1}{5}$ *Quot. or answer.*

Here I say the fives in 12, twice, and there remains 2, which are two pounds, (for the remainder is always the same with your *Dividend*) or 40 shillings, and 10*s.* in the shillings place, is 50*s.* the fives in 50, ten times, which I put in its place, *viz.* under the place of shillings. Then the fives in 6, once, and there remains 1, which is one fifth of a penny. So each man must have 2*l.* 10*s.* 1*d.* $\frac{1}{5}$.

The Common way.

The foregoing work is much sooner done, and looks a great deal handsomer than that in the margin; for there you are obliged to reduce the 12 *l.* 10*s.* 6*d.* into pence, and then you divide by 5, and the *Quotient* gives the pence each person must have; and then those pence are brought into pounds, &c. The sum above is proved by the brief rules in Multiplication of money, sufficiently shewn in that rule in the following manner.

<i>l.</i>	<i>s.</i>	<i>d.</i>
12	10	6
	20	
	—	
	250	
	12	
	—	
	5)3006($\frac{1}{5}$	
	—	
	12)601(1	
	—	
	2 0)5 0(1	
	—	
	2	10 1 $\frac{1}{5}$
	—	
		<i>l. 2 &c.</i>

l. 2 10 1 $\frac{1}{2}$ Each
5 Persons.

12 10 6 Proof.

In this excellent method of *Division* of several denominations (for *Weight* or *Measure* may be so divided as well as *Money*) whatever remains, you always bring it (in your mind only) into the quality of the next denomination towards the right hand; and if there be any thing there, you take it in, and then seek, &c. as in the foregoing sum, where I said, the fives in 12, twice, and there remained 2, which I turned into shillings, (the name of the next denomination) which with the 10 shillings in the place of shillings, make 50; then I say, the fives in fifty, &c.

8)
Again, divide l. 67 09 4 among 8 persons.

Quotient. l. 08 08 8 Answer.

Here I say the eights in 67, 8 times, and there remains 3l. or 60 shillings, and 9 shillings in the place of shillings, is 69, the eights in 69, 8 times, and there remains 5 shillings, or 60 pence, and the 4d. in the place of pence, make 64; the eights in 64, 8 times, and nothing remaining. So each must have 8l. 08s. 8d. as by the work above.

If 5 gallons of Brandy cost 1l. 16s. 8d. what is that the gallon?

A General Rule.

Divide the money by the quantity: And here I say, the fives in 36, &c.

$$\begin{array}{r} \text{l.} \quad \text{s.} \quad \text{d.} \\ 5) 1 \quad 16 \quad 8 \\ \hline \end{array}$$

$$\text{Anfw.} \quad 0 \quad 07 \quad 4 \quad 5$$

$$\text{Proof.} \quad 1 \quad 16 \quad 8$$

If 9 stone of Beef cost
what is that a Stone?

$$\begin{array}{r} 9) \text{s.} \quad \text{d.} \\ 16 \quad 6 \\ \hline \end{array}$$

1 10 Answer

If 9 gallons of Arrack cost
what is that a gallon?

$$\begin{array}{r} 9) \\ \text{l.} \quad 4 \quad 08 \quad 1 \frac{1}{2} \\ \hline \end{array}$$

$$\text{Answer} \quad 0 \quad 09 \quad 09 \frac{1}{2}$$

If 11C. of Hops cost
what is that per C.?

$$\begin{array}{r} 11) \\ \text{l.} \quad 53 \quad 01 \quad 06 \\ \hline \end{array}$$

$$\text{Answer} \quad 4 \quad 16 \quad 06$$

If the charge of a country feast amounts to 314/
6s. 8d. and it is to be paid by 12 Stewards, what
must each Steward pay?

$$\begin{array}{r} 12) \\ \text{l.} \quad 314 \quad 16 \quad 8 \\ \hline \end{array}$$

$$\text{Each must pay} \quad \text{l.} \quad 26 \quad 04 \quad 8 \frac{1}{2} \quad \frac{8}{12}$$

$$314 \quad 16 \quad 8 \text{ Proof.}$$

XI. As in Division of one denomination, according to the 9th rule of this chapter, where two numbers in the *Multiplication-Table* make the Divisor, being multiplied together, the work might be performed at two Divisions; so in Division of several denominations, the work may be done after the same method, following the directions given in the said 9th rule.

Example.

A reckoning of £. 6 00 00 among 32 men, what must each man pay?

$$\begin{array}{r}
 4) \text{ £. } 6 \text{ } 00 \text{ } 0 \\
 \hline
 8) \text{ } 1 \text{ } 10 \text{ } 0 \\
 \hline
 \text{Each pays } 0 \text{ } 3 \text{ } 9
 \end{array}$$

Here the two numbers are 4 and 8, therefore I first divide by 4, and then that Quotient by 8; or first by 8, and then by 4, it will be all one.

If 56lb of Coffee cost what is that a pound?

$$\begin{array}{r}
 7) \\
 \text{£. } 21 \text{ } 11 \text{ } 8 \\
 \hline
 8) 3 \text{ } 01 \text{ } 8 \\
 \hline
 \text{Answ. } 00 \text{ } 07 \text{ } 8\frac{1}{2}
 \end{array}$$

Divide £. 32 12 6 between 100 persons.

$$\begin{array}{r}
 10) 3 \text{ } 05 \text{ } 3 \\
 \hline
 0 \text{ } 06 \text{ } 6\frac{1}{2} \text{ each.} \\
 \hline
 \hline
 \end{array}$$

If 72 Gallons of wine cost
what a Gallon?

$$\begin{array}{r} 8) \\ l. \ 19 \ 4 \ 0 \end{array}$$

$$\begin{array}{r} 9) \ 2 \ 08 \ 0 \end{array}$$

$$\text{Anfw. } 0 \ 05 \ 4$$

If 8 lb. of nutmegs cost
what a pound?

$$\begin{array}{r} l. \ 9)49 \ 17 \ 3 \ \frac{3}{4} \end{array}$$

$$\begin{array}{r} 9) \ 5 \ 10 \ 9 \ \frac{3}{4} \end{array}$$

$$\text{Anfw. } 0 \ 12 \ 3 \ \frac{3}{4}$$

If 45 C. of Hops cost
what 1 C. Weight?

$$\begin{array}{r} l. \ 5)120 \ 07 \ 6 \end{array}$$

$$\begin{array}{r} 9) \ 24 \ 01 \ 6 \end{array}$$

$$\text{Anfw. } l. \ 2 \ 13 \ 6$$

A General RULE for WEIGHT.

Having the price of a C. weight, to know the price of a pound. Divide by 7 and 8, (7 times 8 being 56, the half hundred weight) and take the half of the last Quotient, which half will be the answer.

Examples.

If 112 lb. of Cast-iron cost
what a pound?

$$\begin{array}{r} s. \ d. \\ 7)2 \ 4 \end{array}$$

$$\begin{array}{r} 8) \ 4 \end{array}$$

$$\begin{array}{r} 2 \end{array}$$

The half of a half-penny is

$\frac{1}{2}$ Price of a lb.

If

If 112lb. of lead cost
what a pound?

$$\begin{array}{r}
 7) \\
 7s. \\
 \hline
 8) \quad 1 \\
 \quad 1 \frac{1}{2} \\
 \hline
 \text{The half is} \quad \frac{3}{4}
 \end{array}$$

If 112lb. of Sugar cost
what a pound?

$$\begin{array}{r}
 7) \\
 l. \quad 1 \quad 17 \quad 4 \\
 \hline
 8) \quad 05 \quad 4 \\
 \hline
 \quad \quad \quad 8 \\
 \hline
 \end{array}$$

The half of 8 is $4d.$ *Anfw.*

If 112lb. of Currants cost
what a pound?

$$\begin{array}{r}
 7) \\
 l. \quad 3 \quad 10 \\
 \hline
 8) \quad 10 \\
 \hline
 \quad \quad 1 \quad 3 \\
 \hline
 \end{array}$$

The half of $15d.$ is $7\frac{1}{2}$

So at any time, in any Division sum, if the Divisor be 112, the Quotient is soon found by this way of Division by parts.

I will give one *Example* also by the common way, to shew the tediousness of the one, and the expedition of the other.

The

*The common way.*Divide *l.* 1476 19 8 $\frac{1}{4}$ between 27 persons.

$$\begin{array}{r}
 20 \\
 \hline
 29539 \\
 12 \\
 \hline
 354476 \\
 4 \\
 \hline
 \end{array}$$

27)1417907 *Farthings.* 4)52515 *Farthings each.*

$$\begin{array}{r}
 135 \\
 \hline
 67 \\
 54 \\
 \hline
 139 \\
 135 \\
 \hline
 40 \\
 27 \\
 \hline
 137 \\
 135 \\
 \hline
 (2)
 \end{array}$$

$$\begin{array}{r}
 12)13128 \frac{1}{4} \\
 \hline
 2|0|109|4 \\
 \hline
 \text{Anfw. } l. \ 54 \quad 14 \quad 0 \frac{3}{4}
 \end{array}$$

The other way.

$$\begin{array}{r}
 l. \ 3)1476 \ 19 \ 8 \frac{1}{4} \\
 \hline
 9)492 \ 06 \ 6 \frac{1}{4} \\
 \hline
 \text{Anfw. } l. \ 54 \quad 14 \quad 0 \frac{3}{4}
 \end{array}$$

Here is a prodigious difference between one way and the other, one having almost 60 figures more in the work than the other.

M

Note,

Note, That weight and measure may be divided by parts, as money.

Examples.

If 42 bags of *Spanish* wool weigh
what 1 bag?

6) C. qrs. lb.

110 1 00

7) 18 1 14

Anfw. 2 2 14

If 45 pieces of linen contain
what one piece?

9) Yds. qrs. Nls.

2157 0 3

5) 239 2 3

Anfw. 47 3 3

CHAP. VI.

REDUCTION.

I. **I**S wholly performed by *Multiplication* and *Division*; and teaches to bring or change numbers of one denomination into numbers of another, without the least alteration of value, though in different terms. For instance,

Suppose I am to bring 20*l.* into farthings, which when I have done, the work will produce 19200 farthings, which are equal in value to *l.* 20: For when they

they are reduced rightly back again, the last quotient will precisely produce *l.* 20. neither more or less.

II. All great names are brought into smaller, of equal value, by *Multiplication*; that is, by multiplying the given number by as many of the next lesser name, as makes one of that greater; as *pounds* into *shillings*, *pence* or *farthings*. Or, *tuns weight* into *pounds weight*, etc.

III. All small names are brought into greater, of equal value, by *Division*; that is, by dividing the given number by as many of the lesser, as make one of the next greater name; as *farthings* into *pence*, *shillings*, or *pounds*; or *pounds weight* into *quarters*, *hundreds*, or *tuns weight*.

Example 1.

In 20*l.* how many farthings? 20*s.*
 20 shillings make a pound. 12

400 shillings in 20*l.* Pence, 240 in a pound.
 12 pence make 1*s.* 4

4800 pence in 20*l.* Farth. 960 in a pound.
 4 farthings, one penny

Or thus:

19200 farthings in 20 *l.* 20*l.*
 960 farthings in
 a pound.
 Farthings. 19200 Answer.

In the question above it is required to bring *pounds* to *farthings*, which is a great name to be brought to a smaller; which according to the 11^d rule of this chapter, is to be done by *Multiplication*. Wherefore, as is there directed, I multiply the given number 20*l.* by 20, the shillings in a pound, and the product

duct is the shillings in 20/. Then those shillings by 12, the pence in a shilling, and the product is the pence in 20/, and those pence, by 4, the farthings in a penny, and that product is the farthings in 20/. and the answer to the question, as may be seen by the preceding work.

Or, as before, I multiply the 20/. by 960, the farthings in a pound, but I multiply 960 by 20. tho' the 20 be uppermost, to save room; for at any time, the *Multiplier* may be multiplied by the *Multiplicand*, the product being the same either way.

By the foregoing methods are all *Reductions* descending, that is, (from great denominations, to lesser) work'd, whether they be *money*, *weight* or *measure*, that is, by considering how many of the next lesser, make a unit, or one of the foregoing greater denominations, as before directed; and then multiply accordingly, descending from one denomination to the next, till the work is finished. And for further assistance, respect must be had to the several tables of quantity in *money*, *weight* and *measure*, in the II^d chapter of this book.

Pounds multiplied by 20 produce shillings; shillings multiplied by 12 give pence; pence multiplied by 4 produce farthings.

Farthings divided by 4 are pence; pence divided by 12 quote shillings; shillings divided by 20 are pounds.

Example 2.

In 19200 farthings, how many pounds?

$$\begin{array}{r} 4 \overline{) 19200} \\ \hline \end{array}$$

$$\begin{array}{r} 12 \overline{) 4800} \\ \hline \end{array}$$

$$\begin{array}{r} 2 \overline{) 400} \\ \hline \end{array}$$

Ans. 120.

Or thus:

$$\begin{array}{r} 96 \overline{) 19200} \\ \underline{192} \\ 0 \end{array}$$

(0)

He

Here it is required to bring farthings into pounds, which is a small name into a greater; and therefore according to the III^d rule of this chapter, it is done by Division: Wherefore I divide the given number, 19200 by 4, the farthings in a penny, and the quotient is pence, and those pence I divide by 12, the pence in a shilling, and the quotient is shillings; and those shillings I divide by 20, the shillings in a pound, and the quotient is pounds; to wit 20*l.* and is a sure proof of the foregoing *example*.

Or I divide the 19200 farthings by 960, the farthings in a pound, and the quotient is the same, *viz.* 20*l.*

Example 3.

In 576*l.* how many shillings, pence, and farthings?

By 20

11520 shillings.

By 12

138240 pence.

By 4

552960 farthings.

(This is a great name to be brought into a smaller, and therefore I multiply.)

Example 4.

In 552960 farthings, how many pence, shillings and pounds?

Divide by {
$$\begin{array}{r} 4 \overline{) 552960} \\ 12 \overline{) 138240} \\ 20 \overline{) 11520} \\ \hline \text{1. 576} \end{array}$$

Answer and proof.

This is the reverse of the 3d *example*, and a small name to be brought into a great, and therefore I divide, and find *l.* 576 the answer and proof to the said *example*; for *Reduction* ascending, proves *Reduction* descending; and the contrary.

Note, When you are to bring shillings into pounds, (let the number be what it will) cut off the last figure or cypher, towards the right hand, and halve the other towards the left, (which is dividing by 20, but shorter) and that half shall be pounds; and the figure cut off is shillings: And if any thing remain, after the halving of the last figure, which is never more than one, it must be joined to the figure, or cypher, cut off, as in the 4th *example* foregoing, and in the subsequent following, viz.

Bring 423|7 shillings into pounds.

l. 211-17

Here the $\frac{1}{2}$ of 4 is 2, the $\frac{1}{2}$ of 2 is 1, and the $\frac{1}{2}$ of 3 is 1, and there remains 1, which is 1 ten, which must be put to the 7 cut off, and it makes 17s. So the whole is *l.* 211-17 as above. By the same method may *tuns* be reduced into *hundreds weight*.

A general R U L E.

When you have pounds to be reduced into farthings, multiply by 20, by 12, and by 4; or by 960 the farthings in a pound.

When you have farthings to be reduced into pounds, divide by 4, by 12, and by 20, or by 960.

If pounds are to be brought into pence, multiply by 240, the pence in a pound: If the contrary, divide by 240.

Example

Example 5.

Reduce 476*l.* into pence.

Or thus: { *According to the 8th Rule of Chap.*

240

19040

952

Pence 114240

{ Here I multiply by 476
12, and by 2, twice 12
12 being 24; and for
the cypher I add it 57 12
at the last. 2

114240

Reduce 114240 pence into pounds, by dividing by 240.

24|0)11424|0(476 Answer.

96

182

168

144

144

(0)

Or thus:

12)11424|0

2) 952

Ans. *l.* 476

Here is the second way, after I have cut off a place from the Dividend, for the Divisor's cypher, I divide by 12, and by 2, which multiplied together make 24, and for the cypher to make it 140, there's a place cut off from the Dividend; so that I divide only by 12, and by 2, according to the IXth rule of the foregoing Chapter. See the work above.

By the second way there are many figures, and much trouble saved; as may be seen by comparing one way with the other.

Example

Example 6.

Bring 476 pounds into farthings, by multiplying
by

$$\begin{array}{r}
 960 \\
 476 \\
 \hline
 5760 \\
 6720 \\
 3840 \\
 \hline
 \end{array}$$

Farthings 456960

Or thus:

$$\begin{array}{r}
 l. 476 \\
 8 \\
 \hline
 \end{array}$$

3808

12

Farthings 456960

In the second way I multiply by 8, and by 12, according to the VIIIth rule of the IVth chapter, 8 times 12, making 96, and I add the cypher at last.

Example 7.

Bring 456960 farthings into pounds, by dividing
by

$$\begin{array}{r}
 384 \\
 \hline
 \end{array}$$

729

672

576

576

(0)

Or thus:

$$\begin{array}{r}
 8)45696|0 \\
 \hline
 \end{array}$$

12) 5712

l. 476 Answ.

IV. When the sum to be reduced consists of several denominations; as pounds, shillings, and pence, or tuns, hundreds, quarters, and pounds, then you must multiply as before; but you must take in the shillings, pence, or farthings, that stand in each denomination, as you reduce the higher name to the next inferior.

Example

Example 8.

In £. 426 19 8 $\frac{1}{2}$ how many farthings?

20

8539 Shillings.

12

102476 Pence.

4

409906 Farthings. *Answ.*

Here I first multiply by 20, saying, 0 is nothing, but 9 that stands in the units place of Shillings, is 9; then twice 6 is 12, and 1 that stands in the tens place of shillings is 13, 3 and carry 1, &c. Then, when I come to reduce the shillings into pence, I say 12 times 9 is 108, and 8 that stands in the place of pence is 116, 6, and carry 11, &c. Then, when I reduce the pence into farthings, I say, 4 times 6 is 24, and 2 that stands in the place of farthings is 26, 6 and carry 2, &c. See the work.

Example 9.

4)

In 409906 farthings, how many pence, shillings, and (and pounds?)

d.

12)102476 $\frac{1}{2}$

s.

2|0) 853|9-8d.

£. 426-19-8d. $\frac{1}{2}$ Answer and Proof.

I first

I first divide by 4, and there remains $\frac{1}{2}$ that was taken in; and then by 12, and there remains the 8d. taken in: and then by 20, (or cut off the last figure, and halve the other, as before directed, to bring shillings into pounds) and there remains the 19 shillings taken in.

Example 10.

4)
In 2403590 farthings how many pounds, &c.

$$\begin{array}{r} 12)600897\frac{1}{2} \\ \hline 2|0)5007|4-9d. \\ \hline \text{£. } 2503-14-9\frac{1}{2} \end{array}$$

Here I divide by 4, by 12, and by 20, according to the foregoing general rule.

Example 11.

In £. 2503-14-9 $\frac{1}{2}$ how many farthings?

$$\begin{array}{r} 20 \\ \hline 50074 \\ 12 \\ \hline 600897 \\ 4 \\ \hline \end{array}$$

Here I multiply by 20, by 12, and by 4, according to the before-mentioned general rule.

2403590 Farthings.

These two sums are a proof to each other.

*In 30 marks, and 40 groats, and 50 English crowns,
How much in value is their worth, intrinsically in pounds.*

Ans. 33 3 4

Example

Example 12.

In *l.* 742-14-6 how many pence?

20	
14854	Here I multiply by 20, and take in the 14s. and then by 12, and take in the 6, according to the
12	
178254	

Ans. IVth rule of this chapter.

Example 13.

¹²⁾
In 178254 pence how many pounds, &c.

2|0)1485|4-6

l. 742-14-6 *Answer.*

In *l.* 759 17 8½, how many halfpence?

Answer 364745

Multiply by 20, 12, and 2.

Bring 364745 halfpence into pounds, &c.

Divide by 2, 12, and 20.

Or halfpence may be brought into pounds by dividing componently, by 480, and pounds into halfpence by multiplying by 480.

In *l.* 529 12 6¼, how many eighths of a penny?

Ans. 1016885.

Multiply by 20, 12, and 8, taking in, &c.

Bring

Bring 1016885 eights of a penny into pounds, &c.

Divide by 8, 12, and 20.

Any number of pence may be brought into pounds, shillings, and pence at one working; thus: Add a cypher to the given number, and divide them by 240, as usual, doubling the last figure of the Quotient for shillings, and the remainder is pence; as for *Example*: Bring the foregoing 13th *Example*, viz. 178254 pence, into pounds, shillings, and pence, at one work.

24|0)178254|0(742 7

168 2

— fac. 742-14-6

102

96

—

65

48

—

174

168

—

Rem. (6d.)

Or thus:

2)178254

12)89127-6

742-7

2

l. 742-14-6

Here the last figure 7, doubled is 14, and the 6 remains.

Or thus:

12)178254

2)1485|4-6

l. 742-14-

Here I omit the cypher; because neglect it in the Divisor.

So likewise may farthings be brought into pounds, shillings, pence or farthings at one work, by adding a cypher, and dividing by 960, doubling the last figure of the Quotient for shillings, as above.

Exam

OF COINS.

Here the several species of *Coin* must be reduced into one name, whether shillings, pence, or farthings, and then divide the greater number by the lesser, and the Quotient will be the answer.

Example 1.

In *l. 262-04-6 Sterling*, how many dollars, at

$$\begin{array}{r} 20 \\ \hline 5244 \\ 12 \end{array}$$

 4s. 3d. *Sterling*?

$$\begin{array}{r} 12 \\ \hline \end{array}$$

 Divisor 51 pence.
 Doll. _____
 51)62934 pence. (1234 Answer.

As above directed, I reduce the dollar into pence, and it makes 51: and then also the *l. 262-04-6* into the same name, viz. pence, and they are 62934 which I divide by 51 the pence in a dollar, and the Quotient is the answer, viz. 1234 dollars.

Example 2.

In 1234 dollars, at 4s. 3d. how many *l. Sterling*?

$$\begin{array}{r} 51 \\ \hline 1234 \text{ Multiply } 51 \text{ pence.} \\ 6170 \end{array}$$

12)62934 pence.

2|0)524|4-6

Ans. *l. 262 04 6*

Here I multiply the number of dollars by the pence in one, and the product is the pence that are in them all; which divided by 12, and by 20 which brings those pence into pounds.

Example

Example 3.

In *l.* 562 - 18 how many *French* crowns at

20

(54*d.* $\frac{1}{4}$ per crowns.

8

 11258

12

 433

 135096

8

 Crowns.

433)1080768(2496 Answer.

866...

 2147

1732

 4156

3897

 2598

2598

 (0)

Here I first bring the Crowns into eighths, by multiplying by 8, and taking in the 1 over the 8; and then I do the same, by *l.* 562 - 18, that the Dividend and Divisor may be of the like name; and then I divide the one by the other, and the Quotient gives the answer, *viz.* 2496 Crowns.

Example 4.

In 2496 French Crowns at 54d. $\frac{1}{4}$ per Crown,
433 how many l. Sterl. 8

$$\begin{array}{r}
 7488 \\
 7488 \\
 \hline
 9984 \\
 8 \overline{) 1080768} \text{ eighths.} \\
 \hline
 12 \overline{) 135096} \\
 \hline
 210 \overline{) 112518} \\
 \hline
 \end{array}$$

l. 562 - 18 Ans. and proof to the above question.

Example 5.

In 426 Pistoles at 17s. each, how many guineas at

$$\begin{array}{r}
 204 \qquad 12 \qquad 21s. 6d. \\
 \hline
 1704 \text{ pence} \qquad 204 \text{ Multiplier.} \qquad 12 \\
 8520 \qquad \qquad \qquad \text{Divisor } 258 d.
 \end{array}$$

258)86904(336 $\frac{2}{3}$ $\frac{1}{8}$ guineas Answer.

774..

950

774

1764

1548

(216)

Here the pence in 426 pistoles, are divided by the pence in a guinea, and the Quotient is the answer, viz. 336 guineas, and 216 pence over, which is 18 shillings.

Example

Example 6.

In 336 guineas, and 216 pence how
Pence in a guinea. 258 (many pistoles at 17s. each.

$$\begin{array}{r}
 \text{—————} \quad \quad \quad 12 \\
 2688 \quad \quad \quad \text{—————} \\
 1680 \quad \quad \quad \text{Divisor } 204 \\
 672
 \end{array}$$

216 pence that remained.

————— *Pistoles.*
 204)86904)426 *Answer and proof to the*
 816.. *(foregoing question.*

$$\begin{array}{r}
 530 \\
 408 \\
 \text{—————}
 \end{array}$$

$$\begin{array}{r}
 1224 \\
 1224 \\
 \text{—————}
 \end{array}$$

(0)

Pistoles of 17s. are brought into guineas of 21s.
 by multiplying by 17, and dividing by 21.

Example 7.

In 436 pistoles, how many guineas?

Answer $352\frac{2}{11}$ That is, 353 guineas, wanting 1s.

Guineas into pistoles by the contrary practice.

Broad-pieces at 23s. are brought into ditto at 25s.
 by taking $\frac{1}{5}$ part, viz. pieces 246 at 23s. amounts to
 82l. 18s. the $\frac{1}{5}$ of which gives 6l. 10s. that is of 246,
 which put to 246 pieces, makes 307l. 10s. the va-
 lue of 246 broad-pieces at 25s,

N 3

Example

Example 8.

In 1546 pieces of eight, at 4s. 6d. how many l. Ster.

54 pence in one 12

— piece of eight. —

6184

54

7730

12)83484 pence in them all.

2|0)695|7

l. 349-17 Answer.

Or this question may be done by *Multiplication of Money*, according to the method taught in that rule, thus:

1546 pieces of eight, at $\begin{matrix} s. & d. \\ 4 & 6 \\ 10 \end{matrix}$

l. 02 05 0 The value of
10

22 10 00 of 100.
10

1000—225 00 00

500—112 10 00

40— 9 00 00

6— 1 07 00

Ans. 1546 l. 347 17 00

Examp

Example 9.

In l. 497 06 8 how many marks at 13s. 4d?

$$\begin{array}{r} 20 \\ \hline 9946 \\ 12 \end{array}$$

$$\begin{array}{r} 12 \\ \hline \text{Divisor } 160 \\ \hline \end{array}$$

_____ Marks.
16|0)11936|0(746 Answer.

112..

73

64

96

96

(0)

Or thus:

4)11936

4)2984

Answer. 746 Marks

Here 4 times 4 is 16, omitting the cypher in the Divisor, and therefore cut none off from the Dividend.

Example 10.

In 746 marks at 13s. 4d. how many pounds?

$$\begin{array}{r} 160 \\ \hline 44760 \\ 746 \end{array}$$

$$\begin{array}{r} 12 \\ \hline 160 \\ \hline \end{array}$$

12)119360

2|0)994|6-8d.

119360 Pence

l. 497-6-8 Answ.

Or marks, or any thing else at 13s. 4d. are brought into pounds, &c. by multiplying by 2, and dividing by 3, and what remains will be 1 or 2 nobles.

Pounds shillings, and pence are brought into marks by adding $\frac{1}{2}$, as by *example* the 9th.

In l. 497 06 8 how many marks?

$$\begin{array}{r} 248 \quad 13 \quad 4 \\ \hline \end{array}$$

Marks 746 Answer.

Again

Again, marks are brought into pounds by deduct-
 $\frac{1}{4}$, Example the 9th.

In 746 marks, how many pounds?

248 13 4 the $\frac{1}{4}$ to be deducted.

497 06 8 A. and proof to the example above.

In 40 marks and 90 groats, and pounds in number ten.
 The pence and farthings there contain'd I ask it from
 your pen.

Answer. { 9160 Pence.
 36640 Farthings. }

The 10 Example foregoing may be done by Mul-
 tiplication thus:

746 marks at	13 4	
	10	
Or thus:		
746	1. 6 13 4	{ Value of 10 marks
4	10	
2984	66 13 4	{ Ditto 100 marks.
4	7	
12)119360	466 13 4	{ Ditto 700 Ditto 40 Ditto 6
	26 13 4	
2 0)994 6-8	4 00 0	
1. 497 06 8	Ans. 1. 497 06 8	746

In the example on the left hand, after I have mul-
 tiplied by 4 and by 4, I annex a cypher, to make the
 last product, pence; in regard that there's a 0 in 160,
 the pence in a mark.

Example

Example 11.

In *l.* 389 10 how many florins at 3*s.* 2*d.*

20

12

7790

38*d.*

12

Florins.

38)93480)2460 Answer.

76...

174

152

228

228

(0)

Example 12.

In 2460 Florins at 3*s.* 2*d.* how many *l.* Sterling?

38

12

19680

38 Pence.

7380

12)93480 Pence.

20)7790

l. 389 10 Answer and Proof.

At any time when you can discover how many of one sort of pieces, or coin, are equal to any number of the other, the example is speedily done by multiplying by the lesser, and dividing by the greater number. Example, In 542 4*d.* $\frac{1}{2}$, how many 13*d.* $\frac{1}{2}$? Multiply by 3, and divide by 9. Answer 180 $\frac{6}{9}$ pcs. 13*d.* $\frac{1}{2}$ there being 3 4*d.* $\frac{1}{2}$, and 9 half-pence in 4*d.* $\frac{1}{2}$

Example

Example 13.

In 2712 guilders, at 2s. each, how many rix-dollars at 4s. 5d. $\frac{1}{4}$?

96 16272 24408 214)260352)1216 rix-dol.]	(lars at 4s. 5d. $\frac{1}{4}$) 12 Halfpence 48 in 2s. — 2 53 4 —214 grs. in [dollar]
463 428 355 214 1412 1284 (128)	

Here the answer is 1216 rix-dollars, and 128 farthings.
Remainder, or 2s. 8d.

Pounds are brought into guineas by multiplying by 20, and dividing by 21; thus:

In 730l. how many guineas?

20 7)14600 3)2085 - 5	
Answer 695	Guineas, and 5s. over.

If I had nobles eighty score, and marks just fifty-two
In part of 1400 l. what money rests still due?

Answer 832 l.

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In 695 guineas, and 5s. how many pounds?

guin. s.

695 5

7 and 3 multiply by.

$$\begin{array}{r}
 4865 \\
 3 \\
 \hline
 210 \overline{) 146010} \\
 \hline
 \end{array}
 \left. \vphantom{\begin{array}{r} 4865 \\ 3 \\ \hline 210 \overline{) 146010} \\ \hline \end{array}} \right\} \text{the 5 shillings taken in.}$$

l. 730 Proof.

Example 14.

In 798 l. how many nobles, marks, crowns, shillings, pence, and farthings?

Nobles in 20s.

3

Nobles

2)2394

Marks

1197

I bring the nobles into marks, by dividing them by 2, because 2 nobles make a mark.

789

Crowns in a pound

4

Crowns

3192

Shill. in crown

5

Shillings

15960

Pence in a shilling

12

Pence

191520

Farthings in a penny

4

Farthings

766080

Examples

Examples for Practice.

In *l.* 74622 17 6 how many half-crowns?

Multiply by 8, and take in 7. Answ. 596983

In *l.* 22740 13 4 how many nobles?

Multiply by 3, and take in 2. Answ. 68222

In 76543 *Bitts* of *Jamaica*, each 7*d.* $\frac{1}{2}$ *Sterling*, how many pounds *Sterling*?

Answ. *l.* 2391 19 4 $\frac{1}{2}$

In *l.* 1725 19 4 *Sterling*, how many *Spanish* dollars, at 4*s.* 4*d.*

Anf. 7966

In 279623 *Millreas* of *Portugal*, at 5*s.* 3*d.* $\frac{1}{2}$, how many pounds *Sterling*?

Answ. *l.* 72692 06 2 $\frac{1}{2}$

In 1276 *Moidores*, at 26*s.* 6*d.* how many guineas, at 21*s.*

Answ. 1610 $\frac{41}{11}$

In 150000 *crusadoes*, each 400 *Reas*, 1000 *Reas* to a *Millrea*, at 5*s.* 6*d.* *Sterling*, how many pounds *Sterling*?

Answ. 16500

In *l.* 3400 how many crowns, half-crowns, shillings, groats, and three-pences, and of each the same number?

Answ. 7486 pieces of each sort, and 18*d.* over.

AVOIR.

AVOIRDUPOIS-WEIGHT.

In reducing this weight, *Troy weight*, or of *measure, time, &c.* you must be acquainted with the *tables of quantity*, in the 2d chapter of this book.

Example 1.

Tuns. C. qrs. lb.

In 24 14 3 15 how many pounds weight?
20C. 1 Tun.

494 Hundreds weight.

4 Qrs. 1 C.

1979 Quarters.

28 lb. 1 qr.

15837

3959

A. 55427

Here are great names to be brought into smaller, and therefore to be done by *Multiplication*; wherefore I multiply, according to the table in the aforementioned chapter, *viz.* by 20, by 4, and by 28; taking in the odd weight in each denomination, as in *Reduction of money*; and the last product is the answer, *viz.* 55427.

O

Example

Example 2.

28)
In 55427 pounds, how many tuns, &c.

$$\begin{array}{r}
 28 \dots \\
 \hline
 274 \\
 252 \\
 \hline
 222 \\
 196 \\
 \hline
 267 \\
 252 \\
 \hline
 (15)
 \end{array}$$

$$\begin{array}{r}
 4(1979 \\
 \hline
 2|0)49|4-3 \\
 \hline
 \text{Tuns } 24 \quad 14 \quad 3 \quad 15 \text{ Anf.} \\
 \hline
 \hline
 \end{array}$$

Here I proceed reversely, dividing by 28, by 4, and by 20. Or this *Division* sum may be done by 4 and 7, the component parts of 28.

In 5036 pounds weight of Cotton, how many hundreds weight.

$$\begin{array}{r}
 \text{C. qrs. lb.} \\
 \text{Answer } 44 \quad 3 \quad 24
 \end{array}$$

Example

Example 3.

C. qrs. lb. oz. dr.

In 24 3 24 12 14 how many Drams?

4 Qrs. 1 C.

99 Quarters.

28 lb. 1 Quarter.

796

200

2796 pounds.

16 oz. 1 lb.

16778

2797

44748 Ounces.

16 Drams 1 Oz.

268492

44749

In 16)715982 drams, how many hundreds, &c. 4)

64

16)44748

(28)2796(99 qrs.

32 ...

252 24 3

75

64

127

276

119

112

252

112

154

(24)

112

144

78

64

108

96

142

128

(12)

128

(14) C. 24 3 24 12 14 Answ. and proof.

O 2

Example

Example 4.

In C. 24 3 26 how many pounds?

$$\begin{array}{r}
 4 \\
 \hline
 99 \\
 28 \\
 \hline
 798 \\
 200 \\
 \hline
 \end{array}$$

Answ. 2798 Pounds.

Or thus:

112 lb. a C. Weight.
 24 The number of C.

$$\begin{array}{r}
 448 \\
 224 \\
 \hline
 110 \text{ The odd weight.} \\
 \hline
 \end{array}$$

lb. 2798 Answer.

Example 5.

C. qrs. lb.

In 425 3 22 how many pounds?

Mult. by 112

$$\begin{array}{r}
 5100 \\
 425 \\
 \hline
 106 \text{ odd wt.} \\
 \hline
 \end{array}$$

47706 Answer.

Here I say, 12 times 5 is 60
 60. and take in the odd
 weight at last.

A quicker way.

Hundreds, quarters, and pounds may be speedily reduced into pounds, thus: Set down the gross hundreds, four several times, in the form following, and take in the odd weight, as above.

C. qrs. lb.

In 24 3 26

$$\begin{array}{r}
 24 \\
 24 \\
 24 \\
 \hline
 110 \text{ odd weight.} \\
 \hline
 \end{array}$$

Anf. 2798 pounds above.

Here

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149

Here is nothing to do but to set the hundreds down, as before, with the odd weight, and add them together, and therefore it is the shortest way of all others to reduce hundreds gross into pounds.

More Examples.

In C. 27 3 19 how many pounds?

27	112 lb. 1 C. weight.
27	27
27	
103 odd weight.	784
	224

Answer 3127 pounds.

103 odd weight.

3127 Proof.

In 1 hoghead, qt. C. 7 $\frac{1}{2}$ 12 how many pounds?

7
7
768 odd weight.

Answer 852 pounds.

C. qrs. lb.

In 256 1 17 how many pounds?

256
256
256,45 odd weight.

Answer 287 17 pounds.

In 476 C. $\frac{1}{4}$ 24 lb. of Copper, how many pounds?

Answer 53364.

O 3

In

In C. 4 3 27 how many pounds?

$\begin{array}{r} 4 \\ 4 \\ 4 \\ \hline 111 \text{ odd weight.} \end{array}$	$\begin{array}{r} 112 \text{ lb. 1 C. wt.} \\ 4 \\ \hline 448 \\ 111 \text{ odd weight.} \\ \hline 559 \text{ Proof.} \end{array}$
--	--

559 Answer.

Examples at large.

In C. 9 $\frac{1}{2}$ 14lb. of Indigo, how many pounds?

$$\begin{array}{r} 112 \\ \hline 1078 \text{ Answer.} \end{array}$$

In C. 249 $\frac{1}{2}$ of Cotton Yarn, how many pounds?
Answer 27636.

Tuns C. grs. lb.

In 276 12 3 24 of Cheese, how many pounds?
Answer 619692.

In 574859 pounds of copper, how many tuns, &c.

Tuns C. grs. lb.

Divide by 112, &c. Answer 256 12 2 19

In 426C. of Tobacco, how many boxes, each to weigh 12lb. Answer 3976.

In C. 417 3 12 of Pimento, how many casks, each C. 3 $\frac{1}{4}$ 26 lb. Answer 120.

In 242 casks of nutmegs, each 3 C. $\frac{1}{2}$, how many ounces? Answer 1517824.

Suppose

Suppose 6 Oxen weigh C. 38 2 8 how many stone?

Answer 540.

Turkish silk of 24 ounces to the pound, is reduced to pounds of 16 ounces by adding $\frac{1}{3}$, because 8, the $\frac{1}{3}$ of 16, is the difference between 16 and 24.

Example.

Reduce 756lb. of *Tripoli* Belladine silk, of 24 ounces to the pound, to 16 ounces to the pound.

$$\begin{array}{r} 756 \\ 24 \\ \hline 3024 \\ 1512 \\ \hline \end{array}$$

Short Way.

$$\begin{array}{r} 756 \\ 378 \text{ the } \frac{1}{3} \text{ added.} \\ \hline 1134 \\ \hline \end{array}$$

16)18144(1134 Answer.

If I have C. 155 3 22 of Beef for sea use, and to be cut into pieces, viz. into $\frac{1}{4}$ pound pieces, pound pieces, pound and $\frac{1}{2}$ pieces, 2 pound pieces, 3 and 4 pound pieces, and of each of these quantities an equal number, i. e. as many pieces of 4 pound each, as of pieces of $\frac{1}{4}$ pounds, &c. each, what is the number?

Ans. 1455 pieces and $\frac{6}{11}$, or $\frac{1}{2}$ piece of each quan.

TROY WEIGHT.

lb. oz. dwt. gr.

In 212 10 17 22 how many grains?
12 ounces 1 pound.

2554 ounces
20 dwt. 1 ounce.

51097 penny weights.
24 grains 1 dwt.

$$\begin{array}{r} 204390 \\ 102196 \\ \hline \end{array}$$

1226350 grains answer.

In

In 1226350 grains, how many pounds, &c.?

$$\begin{array}{r}
 24)1226350(\\
 \underline{120} \dots \\
 26 \\
 \underline{24} \\
 235 \\
 \underline{216} \\
 190 \\
 \underline{168} \\
 (22)
 \end{array}
 \qquad
 \begin{array}{r}
 2|0) \\
 \underline{5109|7} \\
 12)2554 \quad 17 \\
 \hline
 \text{lb. } 212 \quad 10 \quad 17 \quad 22
 \end{array}$$

In 246 ingots of silver, each weighing 4lb. $\frac{1}{2}$ Troy, how many ounces?

Answer 13284 oz.

Out of 79680 oz. of silver, how many snuff boxes may be made, each to weigh 3 oz. $\frac{1}{4}$?

Answer 21237 boxes, $\frac{9}{11}$ or $\frac{1}{11}$

What quantity of gold must there be to make 674 funeral rings, each to weigh 3dwt. 12 gr.

Answer 117 oz. 19dwt.

In 47624 bars of Spanish silver, each 56 oz. $\frac{1}{4}$, how many ounces?

Answer 1726370 oz.

How many tankards each to weigh 19 oz. $\frac{1}{2}$ of silver, may be made out of 8658 oz.

Answer 444 tankards.

CLOTH

Yds. qrs. N.

In 246 3 2 how many nails?
4 qrs. 1 yard.

987

4 nails 1 quarter.

Answer 3950 nails.

In 425 ells *Flemish*, how many ells *En.*
3 qrs. 1 ell *Flem.*

5 qrs. 1 ell } 5) —
Englsh. } 1278 qrs.

Eng. ells 255½

Or you may multiply by 6 half quarters, and divide by 10 half quarters, which is shorter; because in dividing by 20, you only cut off a figure from the Dividend, and the work is done.

In 5426 ells *Flemish* how many yards?

3
4)16278

Ans. 4069½ or ½ a yard.

In 376 *French* aulnes or ells, how many yards?
6 qrs. 1 *French* aulne.

4)2256

564 yards, Answer.

In 47290 ells *Flem.* how many ells *Eng.* and yards?

Answer 28374 ells *Eng.* 35467 yds. ½

In 40 score of *Flem.* ells, how many ells of *French*?

*Tw*as given by a prodigal unto a sawcy wench.

Ans. 400 ells *French.*

In

In 564 yards how many aulnes?

$$\begin{array}{r} 4 \\ \hline 6)2256 \end{array}$$

376 Answer and proof, to 376 *French aulnes*
(foregoing.)

Ells English are reduced into yards by adding $\frac{1}{4}$.

More Examples.

In 426 *ells English*, how many yards?
106-2 the $\frac{1}{4}$ to be added.

$$\begin{array}{r} 532-2 \text{ Facit.} \\ \hline \end{array}$$

On the contray, yards are brought into *ells English* by subtracting $\frac{1}{4}$.

In 532 yards $\frac{1}{4}$ how many *ells English*?
106 the $\frac{1}{4}$ to be subtracted.

Ans. 426 *ells English*.

Ells Flemish are brought into yards by deducting $\frac{1}{4}$.

In 5960 *ells Flemish*, how many yards?
1490 the $\frac{1}{4}$ to be subtracted.

$$\begin{array}{r} 4470 \text{ yards.} \\ \hline \end{array}$$

Yards are reduced into *ells Flemish* by adding $\frac{1}{4}$.

In 4470 yards, how many *ells Flemish*?
1490 the $\frac{1}{4}$ to be added.

$$\begin{array}{r} 5960 \\ \hline \end{array}$$

In 45 packs of Cloth each 45 pieces, and each piece
45 *ells Flemish*, how many *ells English* and yards?

Answer 54675 *Ells*.
68343 $\frac{1}{2}$ *Yds*.
Ells

Ells *Flemish* are brought into ells *English*, as expressed before, viz. by multiplying by 6, and dividing by 10; or cutting off the last figure or cypher.

In 4920 ells *Flemish*, how many ells *English*?

$$\begin{array}{r} 6 \\ \hline 10 \overline{) 29520} \end{array}$$

Ans. 2952 ells *English*.

Ells *English* are reduced into ells *Flemish*, by adding a cypher, and dividing by 6, or by adding $\frac{2}{3}$.

In 4726 ells *English*, how many ells *Flemish*?

Or thus:

$$\begin{array}{r} 6 \overline{) 4726,0} \\ \hline 7876\frac{4}{5} \end{array} \quad \begin{array}{r} 4726 \\ 1575\frac{1}{3} \\ \hline 1575\frac{1}{3} \end{array} \quad \left. \begin{array}{l} \\ \\ \end{array} \right\} \begin{array}{l} \text{The } \frac{2}{3} \\ \text{to be added.} \end{array}$$

Ans. 7876 $\frac{4}{5}$ or $\frac{2}{3}$ ells *Flem.*

As before 7876 $\frac{2}{3}$

LIQUID MEASURE.

Tuns. Hhds. Gall.

In 65 2 24 how many pints of Wine?
4 Hhds 1 Tun.

262 Hogheads.

63 Gall. 1 Hoghead.

$$\begin{array}{r} 790 \\ 1574 \end{array}$$

16530 Gallons.

8 Pints 1 Gallon.

132240 Pints, Answer.

In

8)

In 132240 pints of wine, how many tuns, &c.

4)

63)16530(262 Hogheads.

126.. —Hhds. Gallons.

—T. 65 2 24

393

378

150

126

(24)

In 20 tuns of Beer, how many quarts?

4 hogheads 1 tun.

80

54 gall. hoghead of Beer.

320400

4320 gallons.

4 quarts 1 gallon.

17280 quarts, Answer.

54 Gallons make a hoghead of Beer, therefore to bring firkins into hogheads, take $\frac{1}{3}$ part, or divide by 6, and it quotes hogheads, because 6 times 9, the gallons in a firkin, make 54.

To bring hogheads into barrels, add $\frac{1}{3}$, because 18, the $\frac{1}{3}$ of a barrel, and 36 the whole, make 54, the hoghead. To bring kilderkins into hogheads, divide by 3, because 3 times 18 make 54. Barrels are brought into tuns, by dividing by 7, as follows.

7)

In 420 barrels, how many tuns?

60

In 40 butts of curious Beer by people called stout, How many quarts may thence be drawn, before those butts are out? Answer 17280.

Examples.

Admit a ship's cargo from the *Canaries*, to be, viz. 250 pipes, 130 hogheads, and 150 quarter-casks; how many gallons in all; and allowing every pint to be a pound, what is the weight also?

Answer. 44415 gallons, 158 tuns, 12 C. $\frac{1}{4}$.

In 444 firkins of ale, how many pints?

Answer 28416.

In 74640 pints of Beer, how many barrels?

Answer 259 $\frac{6}{16}$.

In 45 fats, or vates of Rhenish Wine, each of 242 gallons, how many *Aumn* casks, each 42 gallons?

Answer 259 $\frac{1}{4}$.

Note, *Rhenish Wine* is sold by the *Aumn*, of about 42 gal.

In 57 pipes and 42 gallons of *Madeira* wine, how many puncheons, hogheads, and tierces?

Answer 86 pun. 115 hhd. 42 Gall. 172 tier.

In 40 tuns, and 50 butts, and 60 pipes of wine, How many tierces do they make, admit they came from Rhine.

Answer 570.

DRY MEASURE.

Lasts qrs. B. G.

In 24 7 6 2 how many gallons of wheat?
10 Quarters 1 Last.

247 Quarters.

8 Bush. 1 Quarter.

1982 Bushels.

8 Gallons 1 Bush.

15858 Gallons.

P

In

In 40 lasts of Barley, how many combs?

Answer. 800.

In 3228 fats, or vates of Sea-coal, how many chaldrons and scores?

Answer { 807 chaldrons.
38 $\frac{1}{2}$ scores.

In 33 weys of Salt, how many quarters, bushels, and pecks?

Answer { 165 Quarters.
1320 Bushels.
5280 Pecks. }

In 20 lasts and 30 weys of corn, that's called rye, How many bushels do they make, if you by bushel buy?

Answer 2800 Bushels.

In 38880 pecks of Sea-coal, how many chaldrons?

Answer 270.

LONG MEASURE.

In 50 Miles, how many barley-corns in length?

8 Furlongs 1 Mile.

400 Furlongs.

220 Yards 1 furlong.

8000

800

88000 Yards.

3 Foot 1 yard.

264000

12 Inches 1 foot.

3168000 Inches.

3 Barl. Corns 1 inch.

9504000 Barley corns in 50 miles.

In 17490 square poles, how many acres, &c.

16|0)1749|0(109 Acres.

16...

149

144

4|0) 5|0(1 Rood.

4.

Acr. Rood. Poles.

(10) Answer 109 1 10

Here is a small name to be brought into a great, and therefore it is performed by *Division*; wherefore I divide the square poles by 160, the square poles in an acre, and the quotient is acres, and the remainder is poles, which I divide by 40, the square poles in a rood, and there comes but one rood, or $\frac{1}{4}$ of an acre, and 10 poles remain. So the whole is 109 acres, 1 rood, and 10 poles, as by the work above.

T I M E.

I desire to know how many days, hours and minutes, there are since the birth of our Saviour to this present year

1734?

365 days in a year.

1734

8670

6 hours wanting. 10404

5202

10404 hours added.

632910 days.

24 hours in a day.

Anno 1734. When an edition of this book was printed, and the altering the date, would have been altering all the work.

2531640

1265820

15189840

10404 hours added.

15200244 hours.

60 minutes in an hour.

912014640 minutes.

Here, in regard that there are 6 hours lost every year, (for the year consists of 365 days, 6 hours) I multiply the years by 6, which produces 10404 hours to be added to the product of hours.

Or it may be done thus: Bring a year into hours, in which you will find 8766, by which multiply that number of years; and that product by 60, and the last product will be the answer; as by the following work.

Days. Hours.

365 6 a Year.
24 Hours 1 Day.

1466

730

8766

1734 Years.

8766 Hours in a year.

10404

10404

12138

13872

15200244 Hours since.

60

912014640 Minutes since.

From the 6th of *June* 1682, to the 15th of *August*, exclusive, 1721, how many days; adding 9 days for the leap-years, being 1 day every 4th year?

Answer 14323.

From the 19th of *August* 1701, to the 21st of *January* exclusive, 1717, (noting the leap-years) how many days?

Answer 5998.

Here follow some questions, promiscuously set for the exercise of the learner's ability.

In 305*l.* 12*s.* 7*d.* how many halfpence? Answer 146702.

In 3192*lb.* weight, how many hundred weight? Answer 28*C.* $\frac{1}{2}$.

In 3*C.* $\frac{1}{4}$ of *Tobacco*, how many 12*lb.* boxes? Answer 35.

In

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In 270lb. 11oz. 12dwt. how many penny-weights?

Answer 65032.

In 730 Rix-dollars, at 4s. 5d. $\frac{3}{4}$, how many ducats at 4s. 4d.?

Answer 754 $\frac{1}{8}$ $\frac{3}{4}$, or 2s. 5d. $\frac{1}{2}$ over.

In 3lb. 10oz. of Gold, how many mourning rings, each 2dwt. 12 grains?

Answer 368.

In 1260 quarts, how many hogsheds of wine?

Answer 5 hogsheds.

In 60 kintals of Pruans, how many C. weight, (a kintal being 100lb.)

Answer 53C. 2qrs. 8lb.

In 506l. 12s. 2d, how many Portugal Reas at 20 for 3d.?

Answer 810560 $\frac{2}{3}$.

In 56 boxes of Sugar, each 2C. $\frac{1}{2}$, how many C. weight?

Answer 154.

In 4679 yards, how many ells Eng.?

Ans. 3743 $\frac{1}{2}$.

In 86l. how many guineas at 21s. 6d.?

Ans. 80 gui.

In 88000 yards, how many miles?

Answer 50.

In 14703 ells *Flemish*, how many yards?

Answer 11027 $\frac{1}{4}$ yards.

In 75C. 3qrs. 24lb. how many pounds?

Answer 8504lb.

In 176C. 2qrs. 24lb. sugar at *Jamaica*, (the C. weight being 100lb.) how many C. weight at *London*, the C. weight being 112?

Answer 157C. 3qrs. 6lb.

In 6000 *French Crowns*, at 57d. each, how many pounds Sterling?

Answer 1425.

In 34lb. 6oz. *Troy*, how many ounces?

Answer 414 ounces.

In guineas ninety, and in Pistoles nine, How many pence, and what in Sterling coin?

The guineas at 21s. } Answer 24516 pence.
and pistoles at 17s. } or 102l. 3s.

In 46 packs of cloth, each pack 24 pieces, and each piece 42 ells *Flemish*, how many ells *English* and yards?

Answer 27820 $\frac{4}{7}$ *Engl.* ells, and 34776 yards.

How many times does a regular clock strike in a year?

Answer 56940:

In 15420 *Vares* of *Valencia*, 100 of which make 85 yards *English*, how many yards and ells *English*?

Ans. 13090 $\frac{2}{11}$ or 14 yds. and 10472 ells *English*:

CHAP. VII.

Of TARE and TRET, &c.

GROSS WEIGHT is the weight of a commodity, with the weight of the hoghead, chest, cask, box, wrapper, or any thing else that contains the goods: Or any quantity given in *hundreds*, *quarters*, and *pounds*, is *gross weight*.

TARE is an allowance made by the seller to the buyer, for the weight of the hoghead, cask, chest, box, bag, &c. wherein the goods are contained. And is sometimes reckoned at so much *per bale*, *bag*, *barrel*, *chest*, &c. As in *Silks*, *Cotton*, *Raisins*, *Capers*: At other times at so much *per C.* as 10, 14, 16, or 24 *lb.* *per C.* There is also a distinction of *Custom-house* and *Invoice Tare*, as in *Tobacco's*, and *Indigo's*, &c. and sometimes uncertain, as in *Tobacco's* and *Sugars*, happening according to the size of the casks.

TRET is an allowance of 4 *lb.* upon every 104 *lb.* *Suttle*, claimed by freemen of *London* (and sometimes to others also) and this is allowed for waste and dust, on some sorts of goods; as on *Tobacco's*, *Spice*, *Drugs*, etc.

CLOFF

CLOFF is an allowance of 2lb. upon every draught above 3C. weight to the citizens of London.

Neat weight is what remains when the allowances are deducted.

Example.

In 29 bags of *Hops*, containing *Gross* 88C. 1 qr. 10lb. Tare 4lb. per C. how many C. neat?

	C.	qrs.	lb.
<i>Gross</i>	88	1	19
<i>Tare</i>	3	0	17
<i>Neat</i>	85	1	02

	C.	qrs.	lb.
	88	1	19
	4 lb. per. C.		
112	(353	Tare	(3C.
	336		
	(17)		

I multiply the given hundred by 4, the *Tare* allowed for each hundred, which produces, with 1 lb. allowed for the quarter, 353 lb. *Tare*, which I divide by 112, and the quotient gives 3C. weight, and 17 lb. remains, which I subtract from the *gross weight*, and the remainder is C. 85 1 02. for the neat weight. See the work.

When the *Tare* is at so much per C. wt. multiply the *gross weight* by the *Tare*, and divide the product by 112, and the quotient will be the *Tare*. Or subtract the *Tare* per C. from 112, and the remainder multiply the *gross weight*, and the product divide by 112, and the Quotient will be the neat weight. Or if you multiply the pounds *gross* by the pounds *Tare*, and divide by 112, the Quotient gives the pounds *Tare*.

In 7 bags of *Cotton*, each 2 C. $\frac{1}{2}$, *Tare* 7 lb. per bag, how many pounds neat?

2 $\frac{1}{2}$ C.

2½ C. each

7 bags.

7

7 lb. Tare each.

17½

49 lb. Tare.

17

17

17,56 the ½ C.

From 1960 lb. Gross.

Sub. 49 lb. Tare.

Answer 1911 lb. Neat.

In 27 bags of Pepper, containing,

4 lb. bag. }

C. qrs. lb.

Tare } Gross 58 3 11 Tare 4lb per bag,
108 lb Tare 58

58

58,95 for 3 qrs. 1 lb.

[How many pounds 6591 pounds Gross.
neat?]

108 Tare.

Ans. 6483 pounds Neat.

Three hogheads of Tobacco, wt. viz.

No. 1 C. 5 1 17 Tare 90lb.

2 6 2 10 — 87

3 5 3 20 — 85

17 3 19 — 262

17

17

[How many pounds
neat]

17

103 odd weight.

2007 Gross weight.

262 pound Tare.

Answ. 1745 pounds neat.

Four Barrels of Indigo, qt. viz.

No.		C. qrs. lb.			lb.
{	1 qt.	4	1	10	Tare 36
	2	3	3	20	— 29
	3	4	0	19	— 32
	4	4	0	00	— 35

How many pounds neat? 16 1 21 — 132

Ans. lb. 1709

Six hogheads of Tobacco, wt. viz.

	C. qrs. lb.			lb.
Tret 4lb. per 104lb.	4	3	21	Tare 76
and Cloff 12lb. How	5	2	17	— 96
many pounds neat?	6	1	20	— 100
	4	3	24	— 84
	7	1	13	— 132
	5	2	26	— 98

The Tret is always found by dividing the futile pounds by 26; because 4 times 26 is 104.

Gross 35 0 09 — 556

35

35

35.9

3929 pounds Gross.

556 pounds Tare.

3373 pounds Suttle.

129½ pounds Tret.

3243½ rest.

12 Cloff.

Answer 3231½ Neat weight.

(19)

The half-pound in the Tret is allowed for the 19 pound remaining.

In

In 5 barrels of *Nutmegs*, wt. 18C. $\frac{1}{2}$, 07lb. *Gross*; *Tare* 30 pounds per barrel; and *Tret* 4 pound per 104l. how many pounds neat?

	C.	grs.	lb.
30lb. <i>Tare</i>	18	2	07
5 Barrels	18		
	18		
150 <i>Tare</i> .	18,63		
	2079	pounds	<i>Gross</i> .
	150 <i>Tare</i> 26)	1929	(74lb. <i>Tr</i> .
		182.	
	1929	rest.	
	74 <i>Tret</i> .	109	
		104	
	1855	<i>Answ.</i>	
		(5)	

When the *Tare* is at so many pounds *per Cent.* or 112lb. if it happen to be any part of a hundred wt. it may be sooner done by dividing the *gross weight* by that part, according to the rule of *Division* of several denominations: As admit it to be at 14lb. *Tare per Cent.* then take the 8th part of the *gross weight*, or divide it by 8, because 14lb. is the 8th part of a hundred weight, and the Quotient will be the *Tare* in *gross weight*, which subtract from the first *gross weight*, and the remainder will be the *neat weight*.

Example.

	C.	grs.	lb.
20 bags, qt. (8)	48	1	24 <i>Gross</i> , <i>Tare</i> 14lb per C.
	6	0	06 $\frac{1}{2}$ <i>Tare</i> .

Facit C. 42 0 17 $\frac{1}{2}$ *Neat Weight*.

Here I say, the eights in 48, 6 times; then the eights in 1, 0 times, but turning it into pounds, that is 28, and

Chap. VII. **TARE and TRET.** 167

24 in the place of pounds make 52; then the eights in 52, 6 times, and there rests 4, which I multiply by 4, the quarters in a pound, and they make 16; then the eights in 16, twice, or $\frac{1}{2}$ a pound. So the *Tare* is 6C. 0qrs. 06lb. $\frac{1}{2}$, which I subtract from 48C. 1qr. 24lb. and the remainder is 42C. 0qrs. 17lb. $\frac{1}{2}$, for the neat weight; as by the work above.

If the *Tare* be 16lb. per Cent. then divide the *gross weight* by 7, because 16lb. is the 7th part of a hundred weight.

Example.

12 Hhds { C. qrs. lb.
qt. (7 { 59 3 14 at 16lb per Cent.

Tare 8 2 06 the 7th part.

Neat Wt. 51 1 08

If the *Tare* be 18lb. per Cent. then for 16 pounds work as in the last *Example*; and for the 2 pound take the 8th part of the Quotient, and add them together for the whole *Tare*.

If the *Tare* be 20lb per Cent. then for the 16 pounds work as before; and for the 4 pounds take the 4th part of the Quotient, and add them together for the whole *Tare*.

If the *Tare* be 8, 10 or 12lb. per Cent. or any lesser number; then take the half of the *gross weight*, which will make it half hundreds; then 8lb. is the 7th part of $\frac{1}{2}$ C. 10lb. is divided into the 7th part, and 4th of that 7th part; 12lb into the 7th part, and half of that part, &c.

Oil is entered at the *Custom-House* by the gallon, and pays duty accordingly; yet in uncertain casks it is weighed, and the *Tare* allowed is 18lb. per C. which being deducted, is computed at 7lb. $\frac{1}{2}$ per gallon; and reduced

reduced thus: Multiply by 94, (that being the neat weight of 112) and the product is the neat pounds, which doubled brings them into half pounds, which divide by 15, the half pounds in 7 gallons and $\frac{1}{2}$, the Quotient gives the content in gallons, which if divided by 252, gives tuns, &c.

Example.

C. qrs. lb.
Reduce 124 3 16 into gallons.

94

496

1116

100

11756 Pounds.

2

Half pounds 15)23512(1567 $\frac{1}{2}$ gallons.

Oil in certain casks, 1 in 20 is allowed for leakidge, but under 10 none.

In Candy barrels the Tare is 29lb. per barrel; and from New-England 50lb. per barrel.

In 46C. of Pruans, Tare 16lb. how many C. neat?

Answer 39 C. 1qr. 20lb.

Admi

M
foreg
impr

Admit 50 barrels of Oil from New-England, to contain

122 C. 3qrs. 12lb.

122

122

122,96

13760 Pounds.

2500 Tare.

11260 Neat.

11260

15)22520(Half pounds.

Ans. 150 $\frac{1}{2}$ Gallons.

Or pounds of Oil are reduced into gallons by multiplying the neat pounds by 2, and dividing that product by 3; and that quotient again by 5, gives the neat gallons of 7lb. $\frac{1}{2}$ per gallon.

T A R E S.

	C.		C.	Alom in Casks	12lb. per C.
Tare	8		12	1 Pot-ashes	10 ditto.
of sugars	12	to	15	1 $\frac{1}{2}$ Argil or Argol	14 ditto.
from	15		17	in Casks,	
				Almonds in bags,	14 ditto.
Oil 18lb. per C.				Raisins in	
Madder in bales, 28lb.				frails or	14lb per
tare per bale,				baskets.	frail.
Ditto in fates or vates,					
10lb. per C.					

Many more examples might be offered, but those foregoing I think are sufficient for the service and improvement of any ingenious person.

C H A P. VIII.

The G O L D E N R U L E.

Or, Rule of Three Direct.

THIS is called the *Rule of Three*, from its having three numbers to work with to find a fourth in proportion to them; which fourth number is the answer to the question.

It is also called the *Golden Rule*, from its excellent use and performances in *Arithmetic*.

And sometimes the *Rule of Proportion*, because the fourth number bears the same rate or reason to the third, as the second does to the first.

I. Observe that of the three given numbers in any question of this *Rule*, you have two of them always of one name, or kind; that is, if one be *money*, so is the other; or if one be *weight*, the other is so also: And one of which numbers must be the first number in stating, and the other the third; and that must always be the third which moves the question, and the other of the same kind, must be the first number; and the other number, which is of another denomination, always possesses the middle place, and is evermore of the same kind with the answer, or fourth number sought. As for *example*.

If 12 ells of *Holland* cost 36s. what will 456 ells cost at that rate?

Here in stating the question for the work, 456 must be the third number, because that is the number that asketh the question; for 'tis required to know what will 456 ells cost? And the other number of the same name,

name, is to be the first, which here is 12; and the last number, which is of the same kind with the number sought, or answer to the question, possesses the middle place, and when stated for the working stands thus :

Ells s. Ells.
If 12 cost 36 what 456 ?

II. When ever it happens, that either one, or both of the extreme numbers, be of divers denominations, they must be reduced into the lowest name mentioned; that is, if they be pounds, shillings, and pence; or C. qrs. and lb. then they must be reduced into pence, or pounds weight. And if one of the extremes be of several denominations, and not the other, yet must both be reduced into one name; that is, if one consists of pounds, shillings and pence, and the other only of pounds, yet that number which is only pounds, must be brought into pence as well as the other, that the first and third numbers may be of like name, which always must be; that is, if the first number be feet, the third number must be feet likewise; and if one be gallons the other must be gallons also, &c. as was said before. If the middle number be of divers denominations, it must be reduced into the lowest name mentioned therein (or lower if there's occasion) as well as the first or third numbers.

III. When the numbers are disposed in such order, as before directed, and stated accordingly, then multiply the 2d and 3d numbers together; that is, the 3d by the 2d, or the 2d by the 3d, (it being all one) and divide that product by the first number, and the quotient of that division will be the answer, and in the same name with the middle number; that is, if the middle number be shillings, so will the quotient also. Or if the middle number be pence, or farthings, so likewise will be the quotient, or answer.

Q 2

For

For the better understanding the foregoing notes and directions, I shall comprise them under those short heads following, *viz.*

1. That must be the third number, which asketh the question.

2. First and third numbers must be of one name, or so reduced.

3. The middle number, if of divers denominations, must be brought into the lowest mentioned; or lower, if occasion require it.

4. Multiply the second and third numbers together, and divide that product by the first number, and the quotient thence arising, will be the answer to the question, in the same name you left your middle number in.

The fourth number, or answer to the question, if in a direct proportion, may be found these three several ways, *viz.*

(1.) By multiplying the 2d and 3d numbers together, and dividing the product by the 1st, and the quotient will be the answer: As in the 4th direction above.

(2.) By dividing the second number by the first, and then multiplying that quotient by the third, and that product will be the number sought.

(3.) By dividing the third by the first, and then multiplying that quotient into the second number, and that product will be the answer.

Tho' all these ways be equally true, and the two last very concise, when either the second or third terms may be divided by the first, yet the first is most in use.

N. B. When the first term is an unit, the answer is found by Multiplication only. When the second or third term is an unit, then the answer will be found by Division only.

Example

Example 1.

If 12 ells of *Holland* cost 36 Shillings, what will 456 cost at that rate?

The numbers being ranked according to the directions given in the first rule of this chapter, they stand thus:

<i>Ells.</i>	<i>s.</i>	<i>Ells.</i>
If 12 cost	36, what	456?
	36	Second number

2736
1368

The first number, 12)16416

2|0) 136|8

Answer l. 68 08

Here (according to rule) I multiply the third number 456 by 36, the second number, and the product is 16416, which I divide by 12, the first number, and the Quotient is 1368, which are so many shillings; because the middle number was left in shillings: then those shillings in the Quotient I bring into pounds, according to the rule given in *Reduction*, page 129, by cutting off the figure towards the right hand, and halving those towards the left, and the answer is 68l. 8s. as may be seen in the work above.

Example 2.

If 456 ells of *Holland* cost 68l. 8s. what will 12 ells cost at that rate? Stated thus as follows:

Q 3 456 68 8 12 *Ells*

Ells. l. s. Ells.
If 456 cost 68 8, what 12?

20

1368

12 Third number.

First number, 456)16416(36s. Answer.

1368

2736

2736

(o)

Here the question lies upon 12 ells; for it is asked, *What will ells cost?* Therefore, in the stating, it is the third number, (as it is also in the question, but sometimes it does not so happen, that the numbers in a question lie in such order, as they ought to do in stating) and the other of the same name is the first, *viz.* 456; and the middle number is of the same name you seek for, *viz.* Money, for we want to know how much money 12 ells will cost; but here the middle number is of more denominations than one, *viz.* of pounds and shillings; and therefore it is brought into the lowest name mentioned, to wit, shillings. Then I multiply the second and third numbers together, and divide their product by the first, and the quotient is the answer, *viz.* 36s. and is a proof to the first *Example*. And so may any question be proved by stating it reversely, or otherwise varying the question several ways.

IV. If after you have divided the product of the second and third numbers multiplied together by the first number, any thing remains, the value of that remainder may be found, by multiplying the said remainder by the parts of the next inferior denomination, that are equal to one of the quotient: That is,

is, suppose the Quotient is shillings, and there is a remainder, that remainder must be multiplied by 12, because 12 of them, *viz.* pence the (next lower denomination) make one of the Quotient, to wit, a shilling, and divide that product by your former Divisor the first number, and the quotient will be the value of that remainder, in the parts aforesaid. And if any yet remain, it must be multiplied by the parts of the next inferior denomination, that are equal to a unit of the last Quotient, and still divide by the same Divisor, &c. And so must you proceed till nothing remains, or till you have brought it as low as you desire.

Example 3.

If one hundred weight of Currants cost 2*l.* 9*s.* 6*d.* what will 45*C.* 3*qrs.* 14*lb.* cost at that rate? *Stated as follows.* Not work'd in this page, but in 176.

If 112

lb. l. s. d. C. grs. lb.
If 112 cost 2 9 6 45 3 14?

20 4

49 183

12 28

594 2d num. 1468

367

5138 third number.

594 second number.

20552

46242

25690

12)

The first number 112)3051972)27249 pence.

224....

2|0)227|0-9d.

811

784 Anf. l. 113-10-9d $\frac{1}{4}$

279

224

557

448

1092

1008

84 Remainder.

4

112)336($\frac{3}{4}$

336

(0)

Here the third number is brought into the lowest name mentioned, *viz.* pounds; therefore the first number, 1 hundred weight, must be in pounds also. Likewise the middle number is brought into the lowest name mentioned in that. Then the second and third numbers are multiplied together, and that product divided by the first; and the quotient is pence; because the middle number was reduced into pence; then the pence in the Quotient are brought into pounds by *Reduction*; and they make 113*l.* 10*s.* 9*d.* But there is a remainder of 84; wherefore I conclude that makes something more; therefore I multiply that remainder by 4, the parts of the next inferior denomination, and divide that product by the former Divisor, *viz.* 112, and it quotes 3, which is three farthings, and nothing remains. So that the whole is 113*l.* 10*s.* 9*d.* $\frac{3}{4}$. See the work.

Example

Example 4.

If 15 weeks pay come to 2*l*. 12*s*. 6*d*. what is that a year? Stated thus:

Weeks.	<i>l</i> .	<i>s</i> .	<i>d</i> .	Weeks.
If 15	give 2	12	6,	what 52?

20

—

52

12

—

630 2d number.

52 3d number.

—

1260

3150

— 12)

1st number 15)32760(2184 Pence.

30 ...

—

2|0)18|2

27

25

—

l. 9-2

126

120

—

60

60

—

(0)

Example

Example 5.

If one ounce of silver be valued at 5s. 2d. what is the value of 240 ounces 15 dwt.

If 1 oz. cost 5s. 2d. what 240 oz. 15 dwt.

20 $\frac{1}{2}$

20

20 penny wts.

48 15 penny weights.

62, 2d number.

9630
28890

1st number, 2|0)29853|0

10 Rem.

12)14926 $\frac{1}{2}$

4 Farth.

2|0)124|3-10-d.

2|0)4|0

Ans. l. 62-3-10 $\frac{1}{2}$

2 qrs.

Example 6.

If a tun of Wine cost 56l. 14s. what costs a quart?

Hbds. l. s. qt. d.

If 4—56-14—1 1008)13608(13 $\frac{1}{2}$ Ans.

63

20

1008.

252

1134

3528

4

12

3024

1008 qts. 13608 Pence.

504

4

1008)2016($\frac{1}{2}$

2016

(0)

Here

Here the middle number is reduced lower than is mentioned, that being but shillings, but I have brought it into pence because I would have the answer the sooner, by not having so many remainders to reduce lower. Here also the second and third numbers are not multiplied together, because I would only produce the same figures again; wherefore I only divide the second number by the first, and the Quotient is the answer in pence, agreeable with the middle number, and the remainder 504, I multiply by 4, and divide again by 1008, according to the rule, and the Quotient produces two farthings more, to be joined to the 13*d*. So the answer is 13*d*. $\frac{1}{2}$ the *Quart*, as by the work may be seen.

Example 7.

Suppose my salary be 73 pounds a year what is that a day?

Days. *l.* *Day.*
If 365 give 73 what 1?

$$\begin{array}{r}
 20 \\
 \hline
 365 \overline{) 1460} (4s. \text{ per day, Answer.} \\
 \underline{1460} \\
 (0)
 \end{array}$$

Here the year is brought into days, that the first number may agree with the third; and here also, I do not multiply by 1, for the reasons above said (for a unit of itself neither multiplies nor divides) and cannot divide 73 by 365, wherefore I bring the pounds into a lower denomination, *viz.* shillings, or lower, if there be occasion. Then I divide according to rule, and the Quotient gives 4*s*. the day for answer, agreeable to the second assertion of *N. B.* in page 160.

Example

Example B.

Nutmegs at 4d. $\frac{1}{2}$ per ounce, what is that the C. wt.

oz. d. lb.

If 1 cost 4 $\frac{1}{2}$, what 112?

$$\begin{array}{r} 4 \\ \hline 18 \end{array} \qquad \begin{array}{r} 16 \\ \hline 672 \\ \hline 112 \end{array}$$

1792 ounces.

18 2d number.

$$\begin{array}{r} 14336 \\ 1792 \\ \hline 4)32256 \\ \hline 12)8064 \\ \hline 2|0)67|2 \\ \hline 33-12 \text{ Answer.} \end{array}$$

Here the middle number is reduced into the lowest name mentioned, viz. farthings, by which I multiply the third, and the product is farthings; and according to rule, I should divide by the first number, but the first number being 1, it neither multiplies nor divides, (as was said before) and therefore the quotient or 4th number, is the same with the product of the 2d and 3d, which is farthings; because the 2d number was farthings, which are reduced into pounds, as above.

I shall now shew, that many times questions in this rule may be contracted, and much sooner wrought by another method of working; that is, only by following the brief methods of *Multiplication* and *Division*, sufficiently shewn in the 4th and 5th chapters of this book.

R

Example

Example 9.

If 5 gallons of Brandy cost 1*l*. 6*s*. 8*d*. what will 63 gallons, or a hoghead, cost at that rate?

The common way.

G. l. s. d. G.
If 5—1 6 8—63
20

—
26
12
—

320 2d Num.
63 3d Number.

—
960
1920
—

5)20160

12)4032 Pence.

2)033(6

1. 16-16 Answer.

The shorter way.

G. l. s. d. G.
If 5—1 6 8—63
9

—
12 0 0
7
—

1st Num. 5)84 0 0

—
Answ. 1. 16 16 0
—

In working by the shorter way, I do not reduce the middle number at all, but multiply according to the 14th rule of the 4th chapter of this book, by 7 and 9 they multiplied together, making the quantity 63 which product I divide 5, the first number, according to the 10th rule of the 5th chapter, and the quotient is the answer, viz. 16*l*. 16*s*. as in the common way. Here in this short method, the rule of stating and working is followed, as in the common way; for the 2d and 3d numbers are multiplied together, and their product divided by the first, but there is above 20 figures difference between one way and the other.

Example

Example 10.

If the wages of 3 weeks come to 2*l.* 3*s.* 6*d.* what is a year's wages at that rate?

Common way.

W. l. s. d. W.
If 3—2 03 6—52

20

43
12

522 Second.

52 3d. l. 2-03-6 M. by (2)

1044
2610

3)27144

12)9048 Pence.

2|0)75|4

l. 37-14 Answer.

Short way.

W. l. s. d. W.
If 3—2 03 6—52

10

21 15 0
5

108 15 0 50

4 07 0 2

1st N. 3)113 02 0 52

Answer *l.* 37 14 0

After I have multiplied by 10, and by 5, which make fifty, I multiply 2*l.* 3*s.* 6*d.* the middle number, by 2, which is wanting, and add them together.

How many yards were in that piece of cloth that cost *l.* 14-2 6, the yard being valued at 7*s.* 6*d.*

Answer 39 yards.

R 2

Example

Example 11.

If 56lb. of Coffee cost 2*l*. 11*s*. 8*d*. what will 3lb. cost at that rate?

Common way.

lb. l. s. d. lb.
If 56—21 11 8—what 3?

20

431

12

5180 Second.

3 Third.

12)

56)15540(277

112

2|3-1½

434

392 *l*. 1-03-1½ *Ans*w.

420

392

28 Remainder.

4

56)112(2

112

(0)

Shorter method.

If 56—21 11 8—3

3

7)64 15 0

8)9 05 0

*Ans*w. *l*. 1 03 1½

Here I divide by the first number at twice, according to the 11th rule of the Vth chapter. Here is above 30 figures difference.

Example

Example 12.

If the freight of a ship be 529*l.* 11*s.* what must be given to A. B. for his $\frac{1}{11}$ parts?

Pts. *l.* *s.* *Pts.*

If 32—give 529 11—what 5?

$$\begin{array}{r} 20 \\ \hline 10591 \\ 5 \\ \hline 20) \\ 32)52955)165|4 \\ 32 \dots \end{array}$$

209

192

—Ans. *l.* 82 14 10 $\frac{4}{11}$, or $\frac{1}{11}$ of a fart.

175

160

Pts.: Short way. *Pts.*

155

118

32—*l.* 529 11—5

5

Rem. 27

12

4)2647 15

8) 661 18 9

32)324(10

32

—Ans. *l.* 82 14 10 $\frac{1}{11}$ of a fart.

Rem. (4)

32

Here is almost 40 figures difference.

For 3 weeks board I pay *l.* 1*s.* 3*d.* What is that a year?

Answer *l.* 9 15

R 3

Example

Example 13.

If 72 C. of Starch cost 63l. what will 15C. at that rate?

C. l. C.
If 72 ——— 63 ——— 15

Work as usual, &c.
Answer l. 13-2-6

Short way.

C. l. C.
If 72 ——— 63 ——— 15

3

189

5

8)945

9)118½ of a l.

l. 13 : 2 : 6

* * Note, If at any time we know but what part the second number is of the first; the same part also will the fourth number (or answer) be of the third. As for example,

If 10s. gain 2s. what 100 l. Answ. 20l.
Which is the 5th part of 100; as 2 is of 10.

Another way.

There is another way of contracting questions in this rule, viz. by dividing the third number by the first, and by that quotient to multiply the second, which product, or products, will be the answer; as in the following examples.

Example

Example 14.

If 8 yards of Cloth cost 4*l.* 10*s.* 8*d.* what will 24 yards at that rate?

Common way.

Yards. *l.* *s.* *d.* Yards.

If 8—4 10 8—24?

20

90

12

1088

24

4352

2176

8)26112

12)3264

2|0)27|2

Answ. 13-12

Second short Way.

Yards. *l.* *s.* *d.* Yards.

If 8—4 10 8—24(3 2

3

Answ. *l.* 13 12 0

Here I divide 24, the third number, by 8, the first number, and it quotes 3: by which I multiply 4*l.* 10*s.* 8*d.* the middle number, and the product is the answer, *viz.* 13*l.* 12*s.* 0*d.* as before. But if the question had been stated contrariwise, *viz.* If 24 Yards cost 13*l.* 12*s.* what 8 Yards? Then you might have done it by the other short way, as follows.

IF

Yards. l. s. Yards.

If 24 cost 13 12, what 8?

8

8) 108 16

3) 13 12

Answ. l. 4 10 8

3) Or thus:

l. 108 16

8) 36 05 $\frac{1}{3}$

As before l. 4 10 8

Or divide the first number (when that is greatest) by the 3d, and by that quotient divide the 2d, and the last quotient is the answer, as under.

Yards.

l. s.

Yards.

If 24—cost 13 12—what 8?

3

3) 4 10 8 Answer.

When any thing remains (in the second short method) after you have divided the third number by the first, then the first and third numbers are not proportional; for if they be, there will remain nothing. In this case, I say, when any thing remains, you must, after you have multiplied the middle number by the quotient, or whole number; then multiply also the middle number by the *Numerator* of the fraction in its lowest terms, and divide that product by the *Denominator*, and add that quotient to the former product of the second number multiplied by the quotient, or whole number aforesaid. An *Example* or two, will make it easy to be understood.

But before I proceed, 'twill be necessary a little to explain the meaning of the *Numerator* and *Denominator* of a fraction, and how to reduce it into its lowest terms.

A fraction, or part of a whole number, arises from *Division*; and what remains after the *Division* is ended, is the *Numerator*, and the *Divisor* is the *Denominator*. As suppose your Divisor is 12, and your remainder

der 4, then 4 is the *Numerator*, and 12 the *Denominator*; and if set *Fraction-wise*, stand as follows:

Remainder 4 Numerator.

Divisor 12 Denominator.

And to reduce this (or any other fraction) into its lowest terms, halve the Numerator, and also the Denominator; or divide them by 3, 4, 5, &c. or by any of the 9 digits; that nothing remain in either; for that figure which divides one without a remainder, may not do so by another, but you must divide both Numerator and Denominator by such a number as leaves no remainder in either. But if you cannot do so, then is the fraction in its lowest terms already.

Example.

Reduce the forementioned fraction $\frac{4}{12}$ into its lowest terms.

$$\frac{1}{2} \left\{ \frac{4}{12} \right\} \frac{2}{6} \left\{ \frac{1}{3} \right\} \text{Lowest Terms.}$$

$$\frac{1}{2} \left\{ \frac{4}{12} \right\} \frac{1}{3} \text{Lowest Terms.}$$

Here I reduce it, by dividing it by 2, or halving it, saying the half of 4 is 2, and the half of 12 is 6: Then again the half of 2 is 1, and the half of 6 is 3; which is as far as I can go, and the fraction is reduced into its lowest terms, viz. $\frac{1}{3}$. But if I divide it by 4, it reduces it sooner; for I say the 4's in 4 once, and the 4's in 12, 3 times: and so it is reduced at once into $\frac{1}{3}$, as per work. And this $\frac{1}{3}$ is equal in value with $\frac{4}{12}$ for as 1 is the 3d part of 3, so is 4 of 12.

Example

Example 15.

If in 15 weeks I spend 5*l.* 5*s.* what is that a year?

The common way.

W. l. s. W.

If 15—5 5—52

20

—

105

52

—

210

525

—

210

—

45

—

96

90

—

60

60

—

(0)

15)5460(36|4

45

—

96

90

—

60

60

—

(0)

—

—

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Short way.

W. l. s. W.

If 15—5 5—52) 17

3

—

15

15

—

2

9

—

18

4

—

36

15

—

5

—

12

05

—

2

09

—

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Ans. l. 18 4

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Example 16.

If 45*l.* buy 15*C.* $\frac{1}{4}$ 12 lb. of Mather, what will 200*l.* buy at that rate?

Common

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Common Way.

Short Way.

l. C. qrs. lb. l.
If 45—15 3 12—200

l. C. qrs. lb. l.
If 45—15 3 12—200(4
4—180

Ans. 70 1 25

C. qrs. lb.
The $\frac{4}{9}$ of 15 3 12

63 1 20 { (20
7 0 05 { 5—
70 1 25 { (45

C. qrs. lb.

45)355200(7893 (79 1 25 Answer.

Here I divide the third number 200, by 45, the first number, and it quotes 4, by which I multiply the middle number C. 15-3-12, and the product is C. 63-1-20. But there is a remainder of $\frac{4}{9}$, which, in its lowest terms, is 4 ninths; wherefore I take the $\frac{4}{9}$ of the middle number, that is, by multiplying by 4, and dividing by 9, according to rule, and there is produced C. 7-0-5 more, to be added to C. 63-1-20, and the total is C. 70-1-25.

Example 17.

If 26 yards of broad Cloth cost l. 12-2-8, what will 248 yards cost at that rate?

Yds. l. s. d. Yds.
26—12 2 8—248?

20

242

12

2912 *Ayre's Arith.*

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23296

11648

5824

12)

26)722176(27776 pence.] l. 115-14-8 Answer.

Shorter

Shorter Way.

$$\begin{array}{r} \text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9) \\ \phantom{\text{If } 26 \text{ --- } 12 \quad 2 \quad 8 \text{ --- } 248(9)} 9 \phantom{\text{ --- } 248(9)} 234 \end{array}$$

109 04 0 - 14/7

76 10 8

7. 115 14 8 Answer ———

13)84 18 8

To be added 6 10 8

Example 18.

If 17 acres of land let for 17*l*. 10*s*. what will 135 acres come to at that rate?

Acres. l. s. Acres. 2

If 27-17 10-135

20

Shorter Way.

350 If $27 \rightarrow 17 \rightarrow 10 \rightarrow 135(5)$

135 135

1750 Anfw. 2.87 10 (0)

1050

350

2/0)

27) 47250(175|0

27...

— 1.87 10

202

180

135

135

Thus

Thus by one of these short ways, may most questions in this rule be answered, and much time, and many figures saved. I shall now only add some questions, with their answers, for the learner's practice.

19. If 18 yards $\frac{3}{4}$ of serge cost 2*l.* 5*s.* how many yards of the same may I have for 300 guineas at 2*l.* 1*s.* 6*d.* each? Answer 2687 $\frac{1}{2}$ yards.

X 20. If 37 acres of land let for *l.* 13-11-4. what is that an acre? Answer 7*s.* 4*d.* per acre.

21. If I have an estate of 470*l.* per annum, what may I expend daily, and yet lay up yearly 130*l.* Answer 18*s.* 7*d.* $\frac{1}{2}$ $\frac{2}{3}$.

22. How many doz. of Stockings, at 11 groats per pair, may I buy for *l.* 190-12? Ans. 86 doz. 7 pr. $\frac{2}{3}$.

23. Bought 6 chests of Sugar, each 6 C. $\frac{3}{4}$, at 56*s.* per C. what come they to? Ans. *l.* 1113-8.

24. Sold a piece of Cloth, *qt.* 29 $\frac{1}{2}$ yards, for *l.* 5-17, what is that per ell *English*? Ans. 4*s.* 11*d.* $\frac{1}{4}$ $\frac{1}{4}$ $\frac{1}{4}$.

25. A owes B. *l.* 296-17, but he compounds for 7*s.* 6*d.* in the pound, what must B receive for his debt? Answer *l.* 111-6-4 $\frac{1}{2}$.

X 26. If the interest of 100*l.* for a year, comes to 6*l.* what is the interest of 315-12-6, for the same time? Answer *l.* 18-18-9.

27. Bought a cask of Wine for *l.* 62-8, how many gallons were in the same, when the gallon was valued at 5*s.* 4*d.*? Ans. 234. gallons.

28. What comes the commission 10, of *l.* 490-12, at *l.* 2 $\frac{1}{2}$ per Cent.? Answer *l.* 12-5-3 $\frac{1}{2}$.

29. If the whole of a Ship cost *l.* 1270-10, what doth $\frac{1}{3}$ parts come to at that rate? Ans. *l.* 119-2-2 $\frac{1}{2}$.

30. If A owes B. *l.* 395-18, but compounds the whole debt for *l.* 100 12, what is that in the pound? Answer 5*s.* 1*d.* almost, or 5*s.* 0 $\frac{1}{2}$ $\frac{7}{8}$ $\frac{4}{8}$.

31. What comes C. 19 2*qrs.* 12*lb* of Sugar 10, at 5*d.* $\frac{1}{2}$ per pound? Ans. *l.* 50-5-6.

32. Arrived from *Turkey*, 246 bales of *Tripoly Bel-ladine*

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ladine raw Silk, weighing one with another, C. 2 $\frac{1}{2}$, at 5s. 6d. the pound, of 24 ounces, what do they amount to?

Answer l. 46723-12s.

33. If I have l. 214 a year, what is that for 19 weeks?

Answer l. 78-3-10 $\frac{1}{2}$.

34. What comes the insurance of l. 642-12-6 to, at 4 guineas *per Cent.* the guineas at 21s. 6d.

Answer l. 27-12-7 $\frac{1}{2}$.

35. If I buy 100 yards of Ribbon, at 3 yards for a shilling, and 100 of *ditto*, at 2 yards for a shilling, and sell it again for 2 shillings the 5 yards, the question is, *Whether I get or lose, and how much?* Ans. I lose 3s. 4d.

36. Shipt for *Jamaica*, 550 pair of silk stockings, at 11s. 6d. *per* pair, and 460 yards of stuff, at 14d. *per* yard; in return of which I have had C. 46 $\frac{1}{2}$ of *Sugar*, at s. 24-6 *per* C. and 1570lb. of *Indigo*, at s. 2-4. *per* lb. what remains due to me of my adventure?

Answer l. 102-12-11 $\frac{1}{2}$.

Exported,	343	01	8
Imported,	240	08	8 $\frac{1}{2}$
Difference,	102	12	11 $\frac{1}{2}$

37. How long will 1000l. last me, if I spend no more or less than 3s. 6d. *per* day? Ans. 15 years, 7 months. (accounting 30 days to the month) and 29 days, $\frac{1}{2}$.

38. Shipt for the *Streights*, 100 pigs of lead, *qt.* C. 283 $\frac{1}{2}$, 12lb. at l. 10-17 *per* fodder, of C. 19 $\frac{1}{2}$, what come they to?

Answer l. 157-18-9 $\frac{1}{2}$.

To rate Town Taxes.

39. Suppose *A* hath an estate of 53l. a year, and payeth 5s. 10d. to the subsidy, what shall *B* pay, whose estate is worth 100l. *per annum*? Ans. 11s. $\frac{4}{5}$.

40. Admit a tax or rate of 39l. is laid on a town for the building of a bridge; and the value of the *town-rent* is 900l. *per annum*, what is each man's proportion to pay, according to his rent? If one man in the town be worth 100l. a year, what shall he pay to the said rate, or 39l.?

Answer l. 4-6 8.

Profit

Profit and Loss.

41. If I buy a tun of wine at 9*l.* per hoghead, and sell it again at 13*l.* per Hoghead, what do I gain per Cent.?

Answer *l.* 44. 8. $10\frac{1}{2}\frac{6}{7}$ or $\frac{3}{7}$.

Company.

42. Two partners join stocks for a certain time, A puts in 250*l.* B. 430*l.* and in trade they have gained 340*l.* what must each man have of the profit, in proportion to his money in company?

l. 250 A.

430 B.

If *l.* 680 — *l.* 340 — *l.* 250 — Ans. *l.* 125

If 680 — 340 — 430 — 215

Proof, 340

Barter.

43. How many dozen of candles, at 5*s.* 2*d.* per doz. must I give for C. $3\frac{1}{2}$ of tallow, at 37*s.* 6*d.* per Cent.?

Answer 25 doz. $\frac{1}{8}\frac{1}{2}$.

Whereas a noble and a mark, just 15 yards did buy, How many ells of the same cloth for 50 pounds had I?

Answer 600 ells.

If 15 pounds cost 16 pence, of bread that's made of rye,

How many loaves, of 6 pounds each, for fourscore pounds had I?

Answer 3000.

If 5 tuns of Logwood cost 56 pounds,
How many full hundreds for 96 crowns?

Answer 42*C.* 3*qrs.* 12 or 24*lb.*

If 15 hundred of our Lead cost 16 pounds in gold,
How much of that Saturnian ore for 40 pounds is sold?

Answer 37*C* $\frac{1}{2}$.

If 30 pence, and 40 groats, buy 50 pints of wine,
What is the cost of 60 quarts in current English coin?

Answer 38 shillings.

If 9 pounds of our English wool, doth 90 pence require,
The value of 1*C.* weight of you I do desire?

Answer 4*l.* 13*s.* 4*d.*

If the the half of a mark buy the fourth of a pound,
How much Cochineal can I have for a Crown?

Answer 3 ounces.

If 16 shillings and a Crown, for 13 weeks supply,
For meat and drink; that is my board, how much a
day give I?

Answer 2*d.* $\frac{1}{2}$ per day.

If that a rule of 3 foot long doth give 5 feet in shade,
And if a steeple 99, how high in feet is't made?

Answer 59 feet $\frac{2}{3}$.

To prove the Rule of Three Direct.

Multiply the fourth number, or answer to the question, by the first; then multiply the second and third numbers together, and if the product be alike, the work is right.

For trial of which, let us prove the first question in this Rule, which was,

If 12 ells cost 3*6s.* what 456 ells?

And

And the answer there found, or fourth number, was 1368 shillings; which multiplied by the first number 12, produces 16416, then multiply also the second and third numbers together; to wit, 36, and 456, and the product is also 16416, wherefore the answer is right.

But observe well, that when there is any remainder, after you have divided the product of the second and third numbers, by the first, such remainder must, in the proof, be added to the product of the first and fourth numbers, which must be equal to the product of the third number, multiplied by the second.

Or, examples may be more intelligibly proved by varying the question, thus:

If 456 ells cost *l.* 68 : 8 what 12 ells? Ans. 36*s.*

As in the second *example* of this rule.



CHAP. IX.

The RULE of THREE Inverse.

I. IN this rule, the 4th number sought, bears the same proportion to the first, as the second does to the third number.

II. The stating of the question in this rule, differs not from the method of stating in the *Direct Rule*; for the number that asketh the question, must be the third number here, as well as there, &c. And to know when the question belongs to this *Rule*, and when to the *Direct*, observe this general rule.

When the question is stated, consider whether the 4th number, or answer, ought to be more or less than the second number, (which is easily known) If more,

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 the least of the two extremes must be your divisor; but
 if it ought to be less, then the biggest of the two ex-
 tremes must be your divisor. [*Here the 1st and 3d num-
 bers are called extremes, with respect to the second.*] If
 the first number is the divisor, then the question be-
 longs to the *Direct Rule*; but if the 3d is the divisor,
 then the question pertains to the *Rule of Three Inverse*.

III. In this rule you must multiply the first and se-
 cond numbers together, and divide that product by
 the third, and the quotient is the answer, in the same
 name with the middle number.

In this rule, *Note also*, That when the third num-
 ber is less than the first, then the answer required will
 be greater than the second.

Or, when the third number is greater than the first,
 the answer will be less than the second.

Example 1.

If 6 mowers can mow a common field in 12 days, in
 what time will 24 mowers do it? *Answ.* In 3 days.
Thus stated,

If 6 ——— require 12 ——— what 24?
 6. First number.

Third number, 24)72(3. days, the answer.

72

(0)

Here I consider the 4th number, or number sought,
 requires less than the 2d; for the more the hands,
 the lesser the time, and therefore the greater of the
 two extremes must be the divisor, which is the 3d
 number, therefore the question is to be answered by
 the *Rule Inverse*. Wherefore, according to *Rule* the
 3d, I multiply the 1st and 2d numbers together, and
 divide by the 3d, and the quotient is the answer, *viz.*
 3 days; as in the preceding work.

Here

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Here, as the third number contains the second twice, so doth the fourth contain the first, according to the first *Rule* of this chapter.

Example 2.

If when Wheat is 4s. the bushel, the 20 penny-loaf weigh 18lb. what must the said 20 penny-loaf weigh when wheat is 6s. the bushel? Ans. 12lb.

If 4 give 18, what 6?

4

6)72(12lb. Answer.

Here also the 4th number requires less; for the dearer the wheat, the lesser or lighter the loaf: So therefore, the greater of the two extrems, viz. 6, is the Divisor, which being the third number, denominates the question to be *Inverse*.

Example 3.

Admit I lend a friend on his occasion, 100/. for 6 months, and he promises me the like kindness when I desire it; but when I came to request it, he could lend me but 75/. the question is, how long I may keep his money, to recompense my curtesy to him? Ans. eight months.

If 100 give 6 what 75?

6.

75)600(8 Months, Answer.

600

(0)

Here it is apparent, the lesser the sum, the more the time; and therefore the lesser extrem is the Divisor, which is 75.

Example

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Example 4.

How many dollars at 4s. 4d. must be given for 360 guilders at 2s. 2d. Answ. 180

s.	d.		s.	d.
If 2	2	give 360, what	4	4?
<u>12</u>		<u>26</u>	<u>12</u>	
26		2160	52	
		<u>720</u>		

52)9360(180 Dollars.

$$\begin{array}{r}
 52 \dots \\
 \hline
 416 \\
 416 \\
 \hline
 (0)
 \end{array}$$

Here the more the value, the fewer the pieces, and therefore the bigger of the extremes is the Divisor, which is the 3d number, and therefore it is *Inverse*.

Example 5.

If 100*l.* principal gain 5*l.* interest in 12 months, what principal will gain as much in 5 months?

Answ. 240*l.*

M.	l.	M.
12	100	5
	<u>12</u>	

$$5)1200$$

l. 240 Principal. Answer.

If 45 acres be mowed by 6 men, how much will they sooner be mowed by 10.

The 6 men in 3 days suppos'd are to do't,

The time must be less, 'cause more are put to't.

Answ. 1 Day, $\frac{3}{10}$.

Example

Example 6.

When an acre of land doth contain 4 poles in breadth then must it *qt.* 40 in length; what must be the length, when there is 13 poles in breadth?

Ans. 12 P. $1\frac{1}{3}$, or 5 foot, $1\frac{1}{3}$. See the work.

P. B. P. L. P. B.

If 4 give 40, what 13?

$$\begin{array}{r}
 4 \\
 \hline
 13 \overline{) 160} (12 \\
 \underline{13} \\
 30 \\
 \underline{26} \\
 4 \\
 16\frac{2}{3} \\
 \hline
 64 \\
 2 \text{ the } \frac{1}{3} \text{ of } 4. \\
 \hline
 13 \overline{) 66} (5 \text{ Foot } 1\frac{1}{3} \\
 \underline{65} \\
 (1)
 \end{array}$$

Here the breadth is more, and therefore the length must be less.

Example 7. A room 30 foot long, and 18 foot wide, is to be covered with painted cloth, how many yards of *Holland Duck*, of $\frac{1}{4}$ wide, will cover it?

Ans. 240 foot, or 80 yards.

Ex. 8. If a man performs a journey in 6 days, when the day is 8 hours long, in what time will he do it, when the day is 12 hours long?

Ans. 4 days.

Example

Ex. 9. If 150 Pioneers cast a trench in 24 hours, how many must be set on to perform it in 6 hours?

Ans. 600 Pioneers.

Ex. 10. If a piece of Grass will graze 56 oxen 6 days, how many must be turned out, that it may last the remaining oxen 16 days? Ans. 35 oxen out, 21 stay.

Ex. 11. How much Shalloon, of 3 qrs. wide, will serve to line 9 yards of cloth, of 7 qrs. wide? Ans. 21 Yds.

Ex. 12. If 10 pounds worth of Wine, at 18d. the bottle, accomodate 30 men, how many will the said ten pounds entertain with wine, at 3s. 6d. the bottle?

Ans. $12\frac{1}{2}$ persons.

Ex. 13. If for 5l. 5s. I have 14C. wt. carried 136 miles, how many miles may I have 24C. carried for the same money?

Ans. $79\frac{1}{2}$ miles.

Ex. 14. In 730 German Rix-dollars, at 4s. 5d. $\frac{3}{4}$ how many Venetian Ducats at 4s. 4d. Ans. 754, $\frac{111}{100}$.

Ex. 15. How many pounds of Coffee, at 5s. 9d. per lb. is equal in value to 426lb. of tea, at 13s. 4d. per lb?

Ans. $987\frac{51}{88}$.

Ex. 16. If 60 ells *English*, be equal to 100 ells *Flemish*, and each ell *English* contains 20 nails of a yard, how many such nails doth the *Flemish* ell contain?

Ans. 12 Nails.

Ex. 17. If 14 Men, in 15 days, build 16 rod of wall, How many men must added be, to do't in 2 that's all?

Ans. 105 Men.



CHAP. X.

The Double RULE of THREE Direct.

I. **Q**UESTIONS in this rule have five given numbers, to find a sixth in proportion.

II.

II. Any question in the *Double Rule of Three* may be answered by two *Single Rules of Three*; that is, at two statings, &c. or by one rule composed of the five given numbers.

III. Three of the five given numbers imply a supposition, and the other two a demand.

Example 1.

If 100*l.* in 12 months gain 6*l.* interest, what will 25*l.* gain in 4 months?

Here the supposition lies on the first numbers, *viz.* 100, 12, and 6, for it is said, If (or suppose) 100*l.* in 12 months, gain 6*l.* interest; and the demand lies on the two last numbers, *viz.* 25 and 4; for it is demanded, what will 25*l.* gain in 4 months?

IV. In your first stating, you must observe always to make that the second number, which is of the same denomination with the number required; and one of the other numbers in the supposition, (it matters not which) must be the first number; and that number in the demand of the same name with the first, must be the third number; and then your first stating will stand thus:

1. Prin.	1. Int.	1. Prin.
If 100—	gain—6,	what—25?

Here the 2d number is of the same name with the number required; for the interest of 25*l.* is required; and the second number is pounds interest; and the first number is pounds principal; and so is the third number 25, being one of the numbers in the demand. And being so stated, I work as in the *Single Rule of Three*, thus:

If

$\begin{array}{ccc} \text{I.P.} & & \text{I.I.} & & \text{I.P.} \\ \text{If } 100 & \text{--- gain } 6, & & \text{--- what } 25? & \\ & & & & 6 \end{array}$

$$\begin{array}{r} 1. \ 1 \overline{) 50} \\ \underline{20} \end{array}$$

10|00 Ans. 1l. 10s.

Here I cut off two figures towards the right hand, which is divided by 100, according to the directions, given in *Division*.

And now having found the interest of 25l. by this first operation, I proceed to the second: And note always, *That the answer to the first stating is the middle number to the second*: as thus:

$\begin{array}{ccc} \text{Mo.} & & \text{s.} & & \text{Mo.} \\ \text{If } 12 & \text{--- give ---} & 30. & \text{--- what } 4? & \\ & & 4 & & \\ & & \underline{\quad} & & \\ & & 12 \overline{) 120} & & \\ & & \underline{\quad} & & \end{array}$

10s. Answer.

Here in the second stating, the remaining number in the supposition is the first; and the other of the same name in the demand, is the third number, and the middle number is of the same name we seek for; viz. interest; and is the answer to the question, viz. 10s.

And thus, by these two operations in the *Rule of Three*, I find the answer to the question, viz. That if 100l. principal in 12 months, gain 6l. interest, then 25l. principal will gain 10 shillings interest in 4 months.

The same answer will also be found, if you work after the following manner:

If

If 12 gain 6, what 4?

$$\begin{array}{r} 4 \\ \hline 12 \overline{)24} \\ 2 \text{ l. Answer} \end{array}$$

If 100 l. gain 2 l. what 25 l.

$$\begin{array}{r} 20 \\ \hline 40 \\ \hline 100 \end{array} \quad \begin{array}{l} s. 40 \text{ 2d numb.} \\ \hline 10 \overline{)100} \text{ Answ. 10s.} \end{array}$$

The middle number in the last stating, is brought into shillings, otherwise I could not have divided by the first number.

V. The last question, or any other in this rule may be also answered by a rule composed of the five given numbers; (as was said in the 11d rule of this chapter) after this manner: State the question so, that the numbers may stand in one continued rank, and in such order, that the first and fourth numbers may be of one denomination, and the second and fifth.

Then multiply the two first numbers together, for a divisor; and the three last together for a dividend, and the quotient will be the answer, in the same name with the middle or third number; for the trial of which, let us take the last example, viz.

T

If

(1)	(2)	(3)	(4)	(5)
<i>l.p.</i>	<i>M.</i>	<i>l.l.</i>	<i>l.p.</i>	<i>M.</i>

If 100 in 12, gain 6, what 25 in 4?

$$\begin{array}{r}
 12 \quad 20 \\
 \hline
 1200 \quad 120 \\
 \quad 25 \text{ 4th number.} \\
 \hline
 \quad 600 \\
 \quad 240 \\
 \hline
 \quad 3000 \\
 \quad 4 \text{ 5th.} \\
 \hline
 \end{array}$$

Divis. $12|00)120|00$

10 Shillings Answer.

Here the question is stated, and worked as before directed; and the answer is 10s. as it was when wrought at two operations.

If the foregoing directions are heedfully attended to, they are sufficient for any one's instruction in the *Double Rule of Three Direct*; and also for the working of any question therein, by the rule composed of 5 numbers, and therefore I shall only add some questions, with their answers, and so proceed to the next rule.

Example. 2. If 750 bushels of oats serve 500 horses 6 days, how many bushels will serve 1000 horses 14 days? Answ. 3500 bushels.

Ex. 3. If 36 acres of grass be mowed by 6 men in 8 days, how many acres will be mowed by 36 men in 38 days? Answ. 1026 acres.

Ex. 4. If 1000lb. of beef or pork, serve 250 seamen 7 days, how many pounds of ditto will serve 550 seamen 63 days or 9 weeks? Answ. 19800lb.

Ex. 5. If a carrier receive 30s. for the carriage of 3C. weight 150 miles, what must he receive for the carriage of 7C. weight 50 miles? Answ. 23s. 4d.

Ex.

Ex. 6. If 100*l.* in 12 months gain 5*l.* interest, what will 63*l.* gain in 6 months at that rate?

Answer *l.* 1 11-6.

Ex. 7. If 6 quarters of malt are sufficient for a family of 12 persons, for 3 months, how many quarters will serve a family of 24 persons 12 months?

Ans*w.* 48 quarters.

Ex. 8. If a person takes in 320*l.* to pay interest for the same, and at the end of 12 months pays for principal and interest *l.* 339-4; the question is, at what rate *per Cent. per annum* did he pay interest?

Ans*w.* 6 *per Cent. per annum.*

Ex. 9. If 15*s.* pay 5 men for 6 days, how much will pay 20 men for 10 days?

Ans*w.* 5*l.*

Ex. 10. If 36 bushels of wheat in one year yield 216 bushels, how much will 36 quarters yield in 6 years?

Ans*w.* 10368 bushels.



CHAP XI.

The Double RULE of THREE Inverse.

QUESTIONS in this rule are wrought by two single *Rules of Three*, as those in the foregoing rule; but you are to observe, that one of the statings, (and never but one) will fall out to be *Inverse*, and must be worked accordingly.

Any question in this rule also, may be answered by the compound rule of five numbers; observing to make the second and fourth numbers of like name, and the third and fifth; then multiply the third and fourth numbers together for a divisor, and the other three remaining numbers together for a dividend, and the quotient will be the answer in the same name with the first number.

Example 1.

If 50 pioneers in 6 days cast a trench 30 yards long, how many pioneers will cast a trench 200 yards long, in 3 days? Answ. $666\frac{2}{3}$ pioneers.

D. Pion. D. Yds. Pion. Yds.
If 6 require 50 what 3? If 30 require 100 what 200?

$$\begin{array}{r} 6 \\ \hline 3 \overline{) 300} \\ \hline 100 \end{array}$$

$$\begin{array}{r} 100 \\ \hline 3 \overline{) 2000 \mid 0} \\ \hline 666\frac{2}{3} \end{array}$$

If 30 require 50 what 200? If 6 require $333\frac{1}{3}$ what 3?

$$\begin{array}{r} 50 \\ \hline 3 \overline{) 1000 \mid 0} \\ \hline \text{Ans. } 333\frac{1}{3} \end{array}$$

$$\begin{array}{r} 6 \\ \hline 3 \overline{) 2000} \\ \hline 666\frac{2}{3} \end{array}$$

Here the question is answered by two single *Rules of Three*, two different ways, as in the foregoing work may be seen; and the first stating in the first way falls out to be *Inverse*, but the last in the second way does the same; for both statings are never *Inverse*, as was said before.

Or it may be done by the compound rule of five numbers thus:

(1) P.	(2) D.	(3) Yds.	(4) D.	(5) Yds.	
If 50	— 6 —	— 30 —	— 3 —	— 200	
		3			6 Second.
		90			1200
					50 First.

$$\begin{array}{r} 9 \overline{) 6000 \mid 0} \\ \hline \text{Ans. } 666\frac{2}{3} \text{ or } \frac{2}{3}. \end{array}$$

Ex-

Example 2. If 100*l.* principal in 12 months gain 6*l.* interest, what principal will gain 18*l.* in 15 months?

Answer 240*l.*

Example 3. If a person travels 320 miles in 10 days, when the day is 12 hours long, in how many days may he travel 600 miles, when the day is 16 hours long?

Ans. 15 Days.

Example 4. If 36*l.* serve for the board of 12 persons 6 weeks, how long or how many weeks will 260*l.* serve for the board of 36 persons?

Ans. 14 $\frac{2}{3}$ Weeks.



CHAP. XII.

Rules of PRACTICE.

THESE rules are most compendiously contrived for the speedy casting up of any sort of goods or merchandize; and therefore are of excellent use among *Merchants, Tradesmen*, etc. for their quick and elegant dispatch of business; and, from their frequent use, are called rules of *Practice*.

Any question in the *Rule of Three*, that hath a unit, or 1 for its number, may be much sooner done by these brief rules, than by the method followed in that, as too much abounding in figures.

In order for working, the following tables are to be well understood, and perfectly got by heart.

The even parts of MONEY.

<i>Parts of a Skill.</i>			<i>Of a Pound.</i>		<i>Parts of a Pound.</i>	
d.					s. d.	
6	} is,	$\frac{1}{2}$	} or	$\frac{1}{20}$	} is,	$\frac{1}{3}$
4		$\frac{1}{3}$		$\frac{1}{20}$		$\frac{1}{3}$
3		$\frac{1}{4}$		$\frac{1}{20}$		$\frac{1}{4}$
2		$\frac{1}{6}$		$\frac{1}{20}$		$\frac{1}{5}$
$1\frac{1}{2}$		$\frac{1}{8}$		$\frac{1}{20}$		$\frac{1}{6}$
1		$\frac{1}{12}$		$\frac{1}{20}$		$\frac{1}{8}$
				$\frac{1}{20}$		$\frac{1}{10}$
		3 Farthings		$\frac{1}{20}$		
		1 Halfpenny		$\frac{1}{20}$		
		1 Farthing.		$\frac{1}{20}$		

The Even of Parts of WEIGHT.

Pts. of a Tun. of		Pts. of C. Weight.		Pts. of $\frac{1}{2}$ C. and $\frac{1}{4}$ C.		
C.						
10	} is	$\frac{1}{2}$	2 qrs.	$\frac{1}{2}$	} is	$\frac{1}{2}$
5		$\frac{1}{4}$	1 qr.	$\frac{1}{4}$		$\frac{1}{4}$
4		$\frac{1}{5}$	0 16 ^{lb}	$\frac{1}{7}$		$\frac{1}{7}$
$2\frac{1}{2}$		$\frac{1}{8}$	0 14	$\frac{1}{8}$	} is	$\frac{1}{8}$
2		$\frac{1}{10}$	0 8	$\frac{1}{10}$		$\frac{1}{10}$
$1\frac{1}{2}$		$\frac{1}{12}$	0 7	$\frac{1}{12}$		$\frac{1}{12}$
1				$\frac{1}{16}$		

I. When the price of the integer is a farthing, take the 4th part of the given number (or divide it by 4) and the quotient is pence, and if any thing remain, it is farthings; then those pence divide by 12 and by 20; or you may take the 6th part of the given number, and the quotient will be three halfpences, and then divide by 8 and by 20. Or else you may take the 12th part, and the quotient will be threepences. *Examples of these several ways follow, viz.*

4)987654

4)987654 lb. of cast Iron, at $\frac{1}{4}$ per lb.

12)246913 — $\frac{1}{2}$ Rem. because the Dividend was
[farthings.

2|0)2057|6 — 1d.

l. 1028-16-1 $\frac{1}{2}$. Answer.

Again.

6)987654

$\frac{1}{4}$)164609 Three half-pence.

2|0)2057|6 — 1d. $\frac{1}{2}$. Because the Dividend was three-
[half-pences.

l. 1028-16-1 $\frac{1}{2}$ Answer.

Once more.

12)987654

Three pences $\frac{1}{4}$)82304 — 1 $\frac{1}{2}$

2|0)2057|6

Answer l. 1028-16-1 $\frac{1}{2}$

I have often observed, that learners are many times in doubt concerning the several remainders, what to call or account them; wherefore let them note once for all, That at any time, whatever remains, it is always of the same name with that you account the Dividend; that is, if the Dividend is accounted farthings. or pence, or shillings, &c. so is the remainder to be reckoned. Or to represent it more intelligibly, the remainder is always such a part of a shilling (if you take

take parts of a shilling) as you take for, whether a $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, or $\frac{1}{7}$; that is, the remainders are either six-pences, groats, three-pences, &c. according to the part you take. And so likewise for the even parts of a pound you may be governed by the same rules.

II. When the price given is $\frac{1}{2}d.$ then take the 12th part of the given number, and the quotient will be six-pences; of which take the half, and they are shillings, which divide by 20, by halving them, &c. to bring them into pounds.

12)5670 lb. Copperas, at $\frac{1}{2}$ per lb.

6d. $\frac{1}{2}$ | 472 — 3d.

2 | 0) 23 | 6

l. 11-16-3 Answ.

lb. Or thus:

$\frac{1}{2}$)5670 Sea-bread at $\frac{1}{2}d.$

1d. $\frac{1}{2}$ | 2835

2 | 0) 23 | 6 — 3d.

l. 11-16-3 Answ.

In the second work I take the $\frac{1}{2}$ of the half-pence, and they make pence, of which I take the $\frac{1}{2}$, a penny being the $\frac{1}{2}$ of a shilling, &c.

III. When the price is 3 farthings, take the $\frac{1}{2}$ of the given number of integers, and that half is 3 half-pennies, or the 8th part, and they are six-pences, which either divide by 8, and by 20, or by $\frac{1}{2}$, and by 20, &c.

$\frac{1}{2}$ 4720 ells of Canvas, at $\frac{3}{4}$

$\frac{1}{2}$ 2360

2 | 0) 29 | 5

l. 14-15 Answ.

Or thus:

$\frac{1}{2}$ 4720 ells at $\frac{1}{2}$

$\frac{1}{2}$ 590

29 | 5

l. 14-15 Answer

IV.

IV. When the given price is pence, and an even part of a shilling, consider what part it is, and divide the given quantity by it, and the quotient is shillings; and those shillings by 20, &c.

1d. $\frac{1}{2}$	549 lb. iron, at 1d. $\frac{1}{2}$.	3d. $\frac{1}{3}$	7654 lb. soap at 3d. $\frac{1}{3}$.
	4)5-9d.		191)3-6
	1.2-5-9 Answ.		1.95-13-6 Answ.
1d. $\frac{1}{3}$	$\frac{1}{3}$ 369 lb. at 1d. $\frac{1}{3}$.	4d. $\frac{1}{4}$	$\frac{1}{4}$ 2486 lb. at 4d. $\frac{1}{4}$.
	4)6-1 $\frac{2}{3}$		82)8-8
	1.2-6-1 $\frac{2}{3}$ Answ.		1.41-8-8 Answ.
2d.	$\frac{1}{2}$ 396 yds. ribbon at 2d.	6d.	$\frac{1}{3}$ 5769 at 6d.
	36		288)4-6
	1.3-6 Answ.		1.144-4-6 Answ.

Sums in *Practice* admit of various ways of working, and equally short, each producing the same answer; and serve as a proof to each other, and 'tis very proper, and most concise, to prove *Practice* by *Practice*. It likewise may be proved by the *Rule of Three*; or by reducing the answer into the same name, with the price, and divide it by the price, and the quotient will be the given quantity; Or if you divide by the quantity, the quotient will be the price.

V. When the price of the integer is pence, and no even part of a shilling, it may be divided into even parts; as 7 pence is composed of the parts $\frac{1}{2}$ and $\frac{1}{4}$, viz. 3d. and 4d. Wherefore, first take $\frac{1}{2}$ of the given number, and then the $\frac{1}{4}$ also, and add both lines together. Likewise 9d. is composed of the parts $\frac{1}{2}$ and $\frac{1}{4}$, or 6d. and 3d. and 5d. of 3d. and 2d. &c.

Some-

Sometimes it is more concise to take part of parts: Suppose 9d. were the price, I first take $\frac{1}{2}$ for 6, and then the $\frac{1}{2}$ of that $\frac{1}{2}$ for the 3d, because 3d is the $\frac{1}{2}$ of 6; and then I add the two lines together. Or, if the price were 5 farthings, I take the $\frac{1}{2}$ for the penny, and then the $\frac{1}{2}$ of that line for the farthing, because a farthing is $\frac{1}{2}$ of a penny.

Examples.

342lb. Candles, at 5d.		489 lb. Loaf-sugar, at 9d.	
3d $\frac{1}{2}$	85 6	6d $\frac{1}{2}$	214 6
2d $\frac{1}{6}$	57 0	3 $\frac{1}{2}$	107 3
	14 2 6		32 1 9
	l. 7 2 6 Answer.		l. 16 1 9 Ans.
679 yds. paving, at 7d.		Or thus: 429 lb. at 9d.	
3d $\frac{1}{2}$	169 9	6d $\frac{1}{2}$	214 6
4d $\frac{1}{4}$	226 4	3 $\frac{1}{2}$	107 3
	39 6 1		32 1 9
	l. 19 16 1 Answer.		l. 16 1 9 Answer.
3790 Yds. linnen, at 10d.		Or thus: Yds. 37900	
6d $\frac{1}{2}$	1895		12 315 8 4
4d $\frac{1}{2}$	1263 4		
	315 8 4		
	l. 157 18 4 Answer.		l. 157 18 4

In the last work I put a cypher to the given number, which is multiplying by 10, and the product is pence? which I divide by 12 and by 20.

Or thus:

1349lb. Tobacco, at 11d.	1349lb. at 11d.
$6d \frac{1}{2}$ 674—6d.	10
$4 \frac{1}{2}$ 449—8	13490
$1 \frac{1}{2}$ 112—5	Odd Penny. 1349
of 4d	
123 6—7	12)14839
l. 61 : 16 : 7 Answ.	123 6—7
	l. 61 : 16 : 7 Answ.

4796 Quarts of beer, at 5 qrs.
$1d \frac{1}{2}$ 399—8
$\frac{1}{2}$ 99—11
of a penny.
49 9—7
Anf. l. 24 : 19 : 7

VI. When the price is pence and farthings, then work for the pence as before ; and for the farthings, observe what part they make, of the parts taken before, which take out of any one of the lines, of which the farthing or farthings make an even part, and add all together.

856 yds. ribbon, at $4d \frac{1}{2}$.	987 yds. painting, [at $10 \frac{1}{2}$.
$4 \frac{1}{2}$ 285--4	$6d \frac{1}{2}$ 493--6
$\frac{1}{2}$ 35--8	4 $\frac{1}{2}$ 329
of 4d.	$\frac{1}{2}$ 41-- $1 \frac{1}{2}$
32 1--0	of 4d 20-- $6 \frac{3}{4}$
l. 16 : 1 : 0	$\frac{1}{2}$ 88 4-- $2 \frac{1}{4}$
	l. 44 : 4 : $2 \frac{1}{4}$ Answ.

Here

Here I first take the $\frac{1}{4}$ part of the given number for the groat; then for the half-pence, I consider it is the 8th part of 4d. wherefore I take the 8th part of that line, viz. 28s. 4d. saying the 8's in 28, &c.

479 lb. pepper, at $(9d \frac{1}{4})$ $6d \frac{1}{4} \overline{) 239-6}$ $3 \frac{1}{2}$ of 6 $\overline{) 119-9}$ $\frac{3}{4}$ of $\frac{3}{4}$ $\overline{) 29-11 \frac{1}{4}}$ $3d \overline{) 38 9-2 \frac{1}{4}}$ <i>l.</i> 19:9:2 $\frac{1}{4}$ Anf.	679 lb. of cotton, at $7d \frac{1}{2}$ $6 \frac{1}{2} \overline{) 339-6}$ $1 \frac{1}{2}$ of $\frac{1}{2}$ $\overline{) 84-10 \frac{1}{2}}$ $of 6d \overline{) 42 4-4 \frac{1}{2}}$ <i>l.</i> 21:4:4 $\frac{1}{2}$ Anf.
---	---

VII. When the price is any number of pence above a shilling, and not two shillings, let the given quantity stand as shillings, and take even parts for the pence, and set the quotient underneath in proper order, without drawing a line, and add it to the given number, and the total will be the answer in shillings.

Examples.

469 Yds stuff, at 13d. $12 \frac{1}{2} \overline{) 39-1d.}$ $50 3-1$ <i>l.</i> 25:8:1 Anf.	742 Yds at 19d. $6d \frac{1}{2} \overline{) 371}$ $1 \frac{1}{2} \overline{) 61-10}$ $of 6d \overline{) 117 4-10}$ <i>l.</i> 58-14-10 Anf.
---	---

Here 469 stands as shillings, of which I take the 12th part for the penny, and add both together: In the next *Example*, 742 stands as shillings, of which I take the $\frac{1}{2}$ for the 6d, and the 6th part of 371, &c.

2460 lb. Tobacco, at 16d.		<i>Or thus:</i>
4d. $\frac{1}{4}$	820	3)2460
	328 0	5)820
	l. 164 Answer.	l. 164

420 ells Holland, at		794 Bush. of Oats,	
4d. $\frac{1}{4}$	140	(20d $\frac{1}{2}$)	6d. $\frac{1}{4}$
4d. $\frac{1}{4}$	140		397
$\frac{1}{2}$ $\frac{1}{8}$	17—6	4d. $\frac{1}{4}$	264—8
of 4d.	71 7—6	$\frac{1}{2}$ $\frac{1}{8}$	33—1
	Ans. l. 35-17-6		148 8-9
			l. 74-8-9 Answer.

Note; That in the second work of the first example above, I divide by 15, according to the 9th rule of the 5th chapter; because 16d. is the 15th part of a pound, as 15 is the 16th part. Or when the price is 14, 16, 18, 21, or 22d. under 2s; if you bring the said prices into 2d, 3d, 4d, 6d. or 8 pences, you may bring them into pounds, &c. at one operation, by taking parts according to the 2d table of *Practice*, at the beginning of the Rules of *Practice*.

Examples.

7890 Yds. at 14d.	988 lb. at 15d.
7	5
2d. $\frac{1}{10}$ 5523,0 Two pen.	3d. $\frac{1}{10}$ 494,0 Three-pen.
Ans. 460-3	Ans. l. 61-15

6709 lb. at 21d.

9

3796 at 22d.

11

$$\begin{array}{r} 3d\frac{1}{10} | 4696.3 \text{ Three-pences. } [2d\frac{1}{10} | 4175.6 \\ \hline \end{array}$$

$$\begin{array}{r} l. 587-0-9 \text{ Answer.} \\ \hline \end{array}$$

$$\begin{array}{r} l. 347-19-4 \text{ Anf.} \\ \hline \end{array}$$

VIII. When the price given is such a number of shillings, or shillings and pence as make an even part of a pound, divide the given quantity by that part, and the quotient will be pounds.

$$1s. 8d. [\frac{1}{2} | 374 \text{ Guild. at } 20d. \quad 746 \text{ Gal. Spirits at } 2s.$$

$$\begin{array}{r} \text{Answ. } 31-3-4 \\ \hline \end{array}$$

$$\begin{array}{r} 2s. [\frac{1}{2} | 74-12 \text{ Anf.} \\ \hline \end{array}$$

In the first of these *examples* I divide the given quantity by 12, because 20d. is $\frac{1}{2}$ of a pound, and there remains 2, which is two 1s. 8d's or 3s. 4d. So the answer is l. 31-3-4.

IX. When at any time, the price is 2s. 2s in the second *example* above, the answer may be known at sight; for 'tis but doubling the last figure towards the right-hand and note it for shillings; and the other figures towards the left hand are pounds, as above, the double of 6 is 12s. and the 2 other figures are pounds, *viz.* 74l. in all 74-12.

From this notion of understanding the value of any quantity, at 2s. at sight, many things may be expeditiously answered, *viz.*

Examples

d.

Examples.

756 Gal. at 3s. 6d. per gal.

494 yds. at 9s. 4d.

75—12 at 2s.

49—4 at 2s.

 $\frac{1}{2}$ 37—16 at 1s.

4 times 2 is 8s.

 $\frac{1}{2}$ 18—18 at 6d.

196—16 at 8s.

l. 132—06 Answ.

24—12 at 1s.

4d. $\frac{1}{2}$ 8—04 at 4d.3s. 4d. $\frac{1}{2}$ 57 6lb. Indigo, at

(3s. 4d.

l. 229—12 Answ.

l. 96 Answ.

4s. $\frac{1}{2}$ 749 pcs. $\frac{3}{4}$ at 4s.5s. $\frac{1}{4}$ 296 yds. Silk, at 5s.

l. 149—16 Answ.

l. 74 Answ.

6s. 8d. $\frac{1}{2}$ 988 Gal. Brandy,

(at 6s. 8d.

2s. 6d. $\frac{1}{4}$ 973 florins at 2s.

(6d.

l. 329—6—8d. Answ.

l. 121—12—6 Answ.

10s. $\frac{1}{2}$ 575 yds. Br. Cloth,

(at 10s.

Here 5 Half-Crowns remain, or 12s. 6d.

l. 287--10 Answ.

X. When the price is shillings and pence, or shillings, pence, and farthings, and no even part of a pound then multiply the given quantity by the shillings in the price, and take parts for the rest, and add all together.

Examples.

756 lb. coffee, at 5s. 8d.

$$\begin{array}{r}
 5 \\
 \hline
 d \overline{) 3780} \\
 4 \overline{) 1} \overline{) 252} \\
 4 \overline{) 1} \overline{) 252} \\
 \hline
 428 \overline{) 4}
 \end{array}$$

l. 214 4 Answ.

436 lb. Cinnamon, at
(9s. 7d.)

$$\begin{array}{r}
 9 \\
 \hline
 d \overline{) 3924} \\
 6 \overline{) 1} \overline{) 218} \\
 1 \overline{) 1} \overline{) 36-4} \\
 \hline
 417 \overline{) 8-4}
 \end{array}$$

l. 208-18-4 Answ.

570 qrs. of wheat, at
32 (32s. 6d.)

$$\begin{array}{r}
 1140 \\
 d \overline{) 1710} \\
 6 \overline{) 1} \overline{) 285} \\
 \hline
 1852 \overline{) 5}
 \end{array}$$

l. 926-5 Answ.

746 C. Cheese, at
27 (27s. 4d.)

$$\begin{array}{r}
 5222 \\
 d \overline{) 1492} \\
 4 \overline{) 1} \overline{) 248-8} \\
 \hline
 2039 \overline{) 0-8}
 \end{array}$$

l. 1019-10-8 Answ.

XI. When the price is shillings and pence, and no even part of pound, yet many times it may be divided into even parts; as 7s. 6d. is composed of 5s. and 2s. 6d. and 11s. 8d. of 10s. and 1s. 8d. 12s. 6d. of 10s. and 2s. 6d. 15s. of 10s. and 5s. &c.

Or thus:

205 Gal. Tent, at, at 7s. 6d.

$$\begin{array}{r}
 205 \\
 5s. \overline{) 1} \overline{) 51-5} \\
 2s. 6d. \overline{) 1} \overline{) 25-12-6} \\
 \hline
 l. 76-17-6
 \end{array}$$

$$\begin{array}{r}
 205 \\
 2s. 6d. \overline{) 1} \overline{) 25-12-6} \\
 [3 \overline{) 1} \overline{) 25-12-6} \text{ is } 7s. 6d. \quad 3 \\
 \hline
 l. 76-17-6
 \end{array}$$

190 Barr. Argal,
 $s. d.$ — at 11s. 6d.

$$\begin{array}{r} 10 \quad | \quad \frac{1}{2} \quad | \quad 95 \\ 1-8 \quad | \quad \frac{1}{2} \quad | \quad 15-16-8 \\ \hline \end{array}$$

l. 110-16-8

172 C. Iron, at
 $s. d.$ — (12s. 6d.)

$$\begin{array}{r} 10 \quad | \quad \frac{1}{2} \quad | \quad 86 \\ 2-6 \quad | \quad \frac{1}{2} \quad | \quad 21-10 \\ \hline \end{array}$$

l. 107-10 Answ.

XII. When at any time the price is an even number of shillings, multiply the quantity by half of the price, and double the first figure of the product, and set it apart for shillings; and the other figures to the left hand will be pounds.

Examples.

79 Bushels wheat, at 6s.

$$\begin{array}{r} 3 \\ \hline \end{array}$$

the half 3
l. 23-14 Answ.

90lb. Sassafras, at 8s.

$$\begin{array}{r} 4 \\ \hline \end{array}$$

Answ. 4
l. 36-00

764 C. Suff. cheese, at 12s.

$$\begin{array}{r} 6 \\ \hline \end{array}$$

the half 6
l. 458-8 Answ.

85 yards of Cloth, at 14s.

$$\begin{array}{r} 7 \\ \hline \end{array}$$

7
l. 59-10 Answ.

326lb. Mace, at 22s.

$$\begin{array}{r} 11 \\ \hline \end{array}$$

11
l. 358-12 Answ.

623 C. Ginger, at 24s.

$$\begin{array}{r} 12 \\ \hline \end{array}$$

12
l. 747-12 Answ.

When the multiplier consists of two places (when the price is an even number of shillings) and that it cannot well be worked to have the product in one line; after you have done with the unit figure; and come to multiply by the second, observe to set the first figure of the product just under the second of the first line; for that doubled and set apart for shillings, takes up the first place.

756C. of Currants, at 48s.

$$\begin{array}{r} 24 \\ \hline 302-8 \\ 1512 \end{array}$$

l. 1814-8 Facit.

219C. at 56s.

$$\begin{array}{r} 28 \\ \hline 175-4 \\ 438 \end{array}$$

l. 613-4 Anf.

When the price is an even number of shillings, if it be required to know what quantity of any thing may be bought for so much money, it may be known by this short rule, viz. annex a cypher to the money, and divide by half of the proposed price.

Examples:

How many pounds of Indigo may be bought for 54*l.* at 4*s.* per lb.

$$\begin{array}{r} 2)540 \\ \hline \end{array}$$

Answ. 270 lb.

What quantity of Cloth at 12*s.* per yard may be bought for 236*l.*?

$$\begin{array}{r} 6)2360 \\ \hline \end{array}$$

Yards 393 $\frac{2}{3}$, or $\frac{1}{3}$ Anf.

How many gallons of Canary at 6*s.* per gallon may be bought for 250*l.*?

$$\begin{array}{r} 3)2500 \\ \hline 833 \frac{1}{3} \end{array}$$

Anf.

XIII. When the price is an odd number of shillings, work for the even part, as in the last rule, and for the odd shilling take the $\frac{1}{20}$ of the given number, and add them together, as in the following examples.

96 Pistoles, at 17s.		260 lb. chin. silk, at 21s.	
8	—	10	—
8-1	—	10-1	—
s. 76-16	—	s. 260-00	—
1 $\frac{1}{20}$ 4-16	—	1 $\frac{1}{20}$ 13-00	—
l. 81-12 Answer.	—	l. 273-00 Answer	—

XIV. When the price of the integer is pounds, shillings, and pence, reduce the pounds and shillings, into shillings, and multiply the given number of integers by the said shillings; and then take parts for the pence, as before. Or if the shillings and pence make an even part or even parts of a pound, then multiply the quantity by the pounds, and take even parts of a pound for the remainder of the price, and add the results together. Or when the price is shillings, above 20, and under 60, you may let the integers stand as pounds, and (without drawing a line) take parts for the odd money, and add all together.

Examples.

G.	l. s. d.	Or thus:
426 turner, at 3-12-6		G. l. s. d.
72	20	426 at 3 12 6
—	—	3
852	72	—
d 2982	—	s. 1278
6 $\frac{1}{4}$ 213	—	10 $\frac{1}{4}$ 213
—	—	2-6d. $\frac{1}{4}$ 53-5
3088 15	—	—
l. 1544-5 Answ.	—	l. 1544-5 Answ.

Or thus:

G.	l. s. d.
316 saltp. at 4-15-6	
95	20
1580	95
d. 2844	—
6 $\frac{1}{2}$ 158	
3017 8	
l. 1508 18	

G.	l. s. d.
316 at 4-15-6	
4	
1264	
158	
79	
7-18	
l. 1508-18 Anf.	

XV. If the quantity given hath any odd weight or measure annexed to it, as $\frac{1}{2}$, a $\frac{1}{2}$, or $\frac{1}{4}$ (after you have work'd as before, for the whole number) then take $\frac{1}{2}$, a $\frac{1}{2}$, or $\frac{1}{4}$ of the price, and add it to the other work.

Examples.

lb.	
256 $\frac{1}{2}$ legee silk,	
15 (at 15s. 7d.)	
1280	$\frac{1}{2}$ 7-9 $\frac{1}{2}$
d. 256	
6 $\frac{1}{2}$ 128	
1 $\frac{1}{2}$ 21-4	
for $\frac{1}{2}$ lb.	7-9 $\frac{1}{2}$
$\frac{1}{2}$ 399 7-1 $\frac{1}{2}$	
l. 199-17-1 $\frac{1}{2}$	

lb.	
326 $\frac{1}{2}$ saff. at 54s. 8d.	
54 gr.	
1304	$\frac{1}{2}$ $\frac{1}{2}$ 27-4
d. 1630	
6 $\frac{1}{2}$ 163	$\frac{1}{2}$ $\frac{1}{2}$ 13-8
2 $\frac{1}{2}$ 54-2	
41-0	
41-0 for the $\frac{1}{2}$	
1786 2-2	
l. 893-2-2	

When you take for 3 *grs.* of any thing, first take $\frac{1}{3}$ of the given price, and then the $\frac{2}{3}$ of that $\frac{1}{3}$, and add them together as above, or you may take the $\frac{1}{3}$ and $\frac{2}{3}$ parts, and add them together; but the other is easier and quickest.

246 $\frac{1}{2}$

d.
5-6

$$\begin{array}{r}
 C. \\
 246\frac{1}{2} \text{ fustic, at } 11s. 6d. \\
 \hline
 246 \\
 6d\frac{1}{2} \ 123 \\
 \hline
 2829 \\
 2-10\frac{1}{2} \\
 \hline
 \frac{1}{10} \ 283 | 1-10\frac{1}{2} \\
 \hline
 l. \ 141-11-10\frac{1}{2} \text{ Ans.}
 \end{array}$$

$$\begin{array}{r}
 Ells. \quad s. \ d. \\
 216\frac{1}{2} \text{ Lawns at } 12-9 \\
 \hline
 12 \\
 \hline
 \frac{1}{3} 2-6\frac{1}{2} \frac{1}{3} \\
 \hline
 d. \ 2592 \\
 6\frac{1}{2} \ 108 \\
 3\frac{1}{2} \ 54 \\
 2-6\frac{1}{2} \frac{1}{3} \\
 \hline
 275 | 6-6\frac{1}{2} \frac{1}{3} \\
 \hline
 l. \ 137-16-6\frac{1}{2} \frac{1}{3}
 \end{array}$$

nf.

or
ve
 $\frac{1}{2}$,
k.

$$\begin{array}{r}
 C. \quad lb. \quad s. \ d. \\
 134\frac{1}{2} \ 14 \text{ raisins at } 31 \ 6 \text{ per Cent.} \\
 \hline
 31 \\
 \hline
 \frac{1}{2} \text{ is } \frac{1}{2} \ 15 \ 9 \\
 14lb. \ \frac{1}{4} \ 3 \ 11\frac{1}{4} \\
 \hline
 402 \\
 19-8\frac{1}{4} \text{ for } \frac{1}{2} C. \ 14lb. \ 19-8\frac{1}{4} \\
 \hline
 417 | 3-8\frac{1}{2} \\
 1208-13-8\frac{1}{2} \text{ Answ.}
 \end{array}$$

d.

Here the even parts of weight must be observed, as they are set down in the beginning of this chapter: As for the $\frac{1}{2}C.$ you take half of the price, and for 14 lb. you take $\frac{1}{4}$ of 15s. 9d. as it being $\frac{1}{2}$ of $\frac{1}{2}$ a C. etc. Sums of this kind, and many others, may as practically be done by *Multiplication* only, (except taking the parts) as it is taught in the first chapter of this book.

Examples

Examples.

C.	s.	d.
75 $\frac{1}{2}$ Nicorago wood,	22	6
		8
	1. 9	00 0
		9
	81	00 0
	3	07 6
	0	11 3
	1. 84	18 9

Here I multiply, first by 8, and then by 9; 8 times 9 making 72; and for the 3 odd hundreds wanting, I multiply the price by 3, and then I take half of the price for the $\frac{1}{2}$ C. and add them together; as by the work may be seen.

C.	s.	d.
63 $\frac{1}{2}$ Allom, at 12	10	per Cent.
		7

Here I multiply
by 7, and by 9;
7 times 9 making
63 the quantity.

4	09	10
		9
1.40	08	6
	6	5
	3	2 $\frac{1}{2}$
1.40	18	1 $\frac{1}{2}$

Or thus:

Hhds.	l.	s.
156 Wine, at ———	12	13 per Hhd.
12		10
1872	126	10
68		10
15-12		
7-16	1265	00
	632	10
l. 1973-08	75	18
	l. 1973	08 Answer.

96 Fodder of lead, at ———	l. 8	13	4
8			12
768	104	00	0
13-4 $\frac{2}{3}$			8
32			
32			
	l. 832	00	0
	l. 832		Answer.

As for short methods of casting up bills of parcels, &c. 'tis best to do them by *Multiplication*, as is directed in that rule.

Here follow some questions, with their answers, for the learner's exercise.

75 C. $\frac{1}{2}$ 19 lb. at 4d. $\frac{1}{2}$ per pound?	Ans. l.	158	18	1 $\frac{1}{2}$
71081 lb. at 35s. 6d. per C.	Ans. l.	1126	10	1
67108 oz. at 16d. $\frac{1}{2}$ per lb.	Ans. l.	283	12	8 $\frac{1}{2}$
71 lb. 10 oz. 15 dwt. at 5s. 9d. per ounce.	Ans. l.	248	00	9 $\frac{1}{2}$
319 yds. at 5s. 6d. per ell.	Ans. l.	70	03	7 $\frac{1}{2}$
419 $\frac{1}{2}$ yds. at 4s. 10d. $\frac{1}{2}$.	Ans. l.	101	13	9 $\frac{1}{4}$
47 qrs. at 4s. 9d. per bush.	Ans. l.	89	06	
715 $\frac{1}{4}$ yds. at 4s. 10d. $\frac{1}{2}$	Ans. l.	173	04	5 $\frac{1}{4}$
				59

59 Ounces, 11 dwt. 18 gr. at 5s. 7d. per Ounce.

Ans. l. 16-12-8

50lb $\frac{1}{4}$ of Silk. at 20d. per oz. Ans. l. 67-13-4

66 Gros, at 3s. 9d. per dozen. Ans. l. 148-10-0

56 Load of hay, at 18d. per trufs. Ans. l. 151-04-0

Sold 3 sacks of rice, contents, viz.

No 1	—4	1	10	Tare 7	} Clough 2lb. per sack, Tret 4lb. per 104lb. at 10d. $\frac{1}{2}$, per lb. neat.
2	—3	2	19	—8	
3	—4	0	20	—7	

What comes the three sacks to? Ans. l. 56-4-11.

For the deducting of *Tare*, *Tret*, &c. the learner must have recourse to the VIIth chap. of this book.

Sugar, 95C. 1qr. 19lb. gros, Tare 12C. 3qrs. 10lb. at 47s. 6d. per C. neat, what comes the sugar to at that rate? Ans. l. 196-2-6 $\frac{1}{2}$.

Other TABLES of the even parts of a SHILLING, and of a POUND.

Parts of a Shilling.

10d.	is	$\frac{5}{8}$
9	is	$\frac{3}{4}$
8	is	$\frac{3}{5}$
7 $\frac{1}{2}$	is	$\frac{3}{8}$
4 $\frac{1}{2}$	is	$\frac{1}{2}$

Parts of a pound.

18s.	is	$\frac{9}{10}$
17 6d.	is	$\frac{8}{10}$
16-8	is	$\frac{7}{10}$
15	is	$\frac{6}{10}$
14	is	$\frac{5}{10}$
13-4	is	$\frac{4}{10}$
12-6	is	$\frac{3}{10}$
8	is	$\frac{2}{10}$
7-6	is	$\frac{1}{10}$
6	is	$\frac{0}{10}$

If the price of the integer be at any of the rates in either of these tables, multiply the given quantity by the numerator, and divide by the denominator, and the quotient will be the answer.

Examples.

II.
-8
-4
-0
-0
ret
3
I.
er
ok.
lb.
at
1
G,
tes
ity
or,
les.

Examples.

d. 10 $\frac{1}{8}$ | 456 lb. Loaf Sugar,
5 (at 10d.

6)2280

38|0

l. 19 Ans.

Foot,

9d. $\frac{1}{2}$ | 765 Glazing, at 9d.

3

4)2295

6)57|3-9

l. 28-13-9 Ans.

C.

8 $\frac{1}{8}$ | 695 Shomac, at 18s.

9

10)625|5

l. 625-10 Ans.

6s. $\frac{1}{8}$ | 950 pr. hose, at 6s.

3

10)285|0

l. 285 Ans.

746 yds paving, at

3

(4d $\frac{1}{2}$

4d $\frac{1}{2}$ | $\frac{1}{8}$ | 2238

27|9-9

13-19-9

lb.

671 Joppa Soap,

5

(at 7d $\frac{1}{2}$

7d $\frac{1}{2}$ | $\frac{1}{8}$ | 3355

41|9-4 $\frac{1}{2}$

l. 20-19-4 $\frac{1}{2}$

lb.

694 Belladine silk

7

(at 17s. 6d.

17s 6d $\frac{1}{8}$ | 4858

l. 607-5 facit.

842 lb. rhubarbat

2

(13s. 4d.

13s 4d. $\frac{1}{8}$ | 1684

l. 561-6-8

X

Other

Other examples of Practice, promiscuously set, and most expeditiously wrought.

	Gal.	d.
d.	4	1536 at 15 per gall.
15 is		
$\frac{1}{10}$ of 4	384	
a l.		
	l. 96 facit.	

8d.	769, 4lb. Tobacco, at
of a l.	8d. per lb.
	l. 256-9-4

5s.	$\frac{1}{4}$	205 yds. at 7s. 6d.
2s. 6d.		
of a l.		
	51-5	
	25-12-6	

Facit l. 76-17-6

40s.	{	125 pcs. at 2l. 5s. 6d.
	{	125 (p. pce.
5s.	$\frac{1}{4}$	31-5
6d.	$\frac{1}{10}$	3-2-6
of 5s.		
	l. 284-7-6 facit.	

	75 C. $\frac{1}{4}$ Logwood at
2s. 6d.	$\frac{1}{4}$ 9-07-6 (22s. 6d.
the $\frac{1}{4}$ C.	11-3
	l. 84-18-9 facit.

	lb.	d.
16d. is	57490 at 16 per lb.	
$\frac{1}{11}$ of 3	1438	
a l.		
	l. 429 $\frac{1}{11}$ facit.	

	756 gall. at 5s. 8d.
5s. $\frac{1}{4}$	189
8d. $\frac{1}{10}$	25-4
	l. 214-4 facit.

	170 lb. raw silk, at
	(16s. 8d.)
10s. $\frac{1}{4}$	85
6s. 8d. $\frac{1}{4}$	56-13-4
	l. 141-13-4 facit.

	215 C. of hops, at 3l
	17s. 6d.
	860
Subt $\frac{1}{4}$	26-17-6
	l. 833-02-6 facit.

Days.

365 at 5d. per day.

6d. $\frac{1}{8}$ 9--02--6

Subt. $\frac{1}{8}$ 1--10--5

l. 7--12--1 Answer

268 12 lb. at 19d.

20d. $\frac{1}{8}$ 2234--06--8

Subt. $\frac{1}{8}$ 111--14--4

l. 2122--12--4

3796 yards, at 22d.

20d. $\frac{1}{8}$ 316-06-8

2d. $\frac{1}{8}$ 31-12-8

l. 347-19-4

75C. at 20s. 8d.

4d. $\frac{1}{8}$ 1--5

4d. $\frac{1}{8}$ 1--5

l. 77--10

C. qrs. lb.

12 3 14 Long Pepper, at

3 10 6

12

42--06--0

$\frac{1}{2}$ C. the $\frac{1}{2}$

1--15--3

$\frac{1}{4}$ a $\frac{1}{2}$ of the $\frac{1}{2}$ C. 17--7 $\frac{1}{4}$

14lb. the $\frac{1}{4}$ of $\frac{1}{2}$ C. 8--9 $\frac{1}{4}$

Facit. l. 45--07--8 $\frac{1}{4}$

lb.

6709 at 21d.

2s. $\frac{1}{8}$

670-18

Subt. $\frac{1}{8}$ for 83-17-3

3d. over

l. 587-00-9 Ans.

When it happens that the price of the integer is a known part of a pound, as 17s. 6d. is $\frac{7}{8}$, 13s. 4d. is $\frac{5}{8}$, 16s. 8d. is $\frac{5}{8}$, and 7s. 6. $\frac{3}{4}$, 6c. then multiply the given number by the numerator, and divide the product by the denominator: Or divide by the denominator, and multiply by the numerator. See the following work.

Examples.

420 Yds at 7s. 6d.

$$\begin{array}{r} 3 \\ \hline 8)1260 \\ \hline \end{array}$$

l. 157 10 facit.

479 Ells, at 17s. 6d.

$$\begin{array}{r} 7 \\ \hline 8)3353 \\ \hline \end{array}$$

l. 419 $\frac{1}{4}$ or 2s. 6d.

697 gall. at 16s. 8d.

$$\begin{array}{r} 5 \\ \hline 6)3485 \\ \hline \end{array}$$

l. 580 $\frac{2}{3}$ or 16s. 8d.

Or thus:

$$\begin{array}{r} 8)420 \\ \hline \end{array}$$

52—10

3

Ans. *l.* 157—10

Or thus:

Subtract $\frac{1}{4}$ *l.* 59—17—6
from the gi-
ven numb.Facit *l.* 419—2—6

Or thus:

Sub. $\frac{1}{2}$ from *l.* 116—03—4
the given
numberFacit *l.* 580—16—8

CHAP. XIII.

COMPANY.

THIS Rule teaches (by knowing the parts of which a joint stock is composed, with a supposed gain or loss resulting therefrom by trade) to estimate or determine each person's particular share of the gain, or loss, in proportion to his principal in the joint stock.

By

By this rule may also a bankrupt's estate be divided among his Creditors. Likewise legacies, &c. adjusted, in case of a deficiency of assets, or effects; and many other things.

I. Questions in this rule are worked by the *Rule of Three*, there being to be as many several statings, as there are members in the joint stock, if none of their stocks be alike.

II. The total sum of the several stocks is to be the first number in the *Rule of Three*; the *Gain*, or *Loss*, the second, and each man's particular stock, the third.

Example 1.

A and *B* enter into partnership; *A* puts into stock 230*l.* and *B* 320*l.* and after twelve months trade, they have gained 165*l.* how much must each person have of the *gain*, in proportion to his money in company.

230*l.* *A.*

320*l.* *B.*

If 550 gain 165, what 230 *l.* *A*'s stock?

$$\begin{array}{r}
 230 \\
 \hline
 4950 \\
 330 \\
 \hline
 55 \overline{) 037950} (69 \text{ l. } A's \text{ share.} \\
 \underline{330 } \\
 495 \\
 \underline{495} \\
 (0)
 \end{array}$$

X 3

Again

Again, If 550*l.* gain 165*l.* what 320*l.* *B*'s stock?

$$\begin{array}{r}
 320 \\
 \hline
 3300 \\
 495 \\
 \hline
 55|0 \quad 5280|0 \quad 96\textit{l. B's share.} \\
 495 \cdot 69 \quad A's share. \\
 \hline
 330 \quad 165 \\
 330 \quad \text{-----Proof.} \\
 \hline
 (0)
 \end{array}$$

Here I add their several stocks together, and they make 550*l.* which is the first number in the *Rule of Three*; the *gain*, viz. 165*l.* the second; and 230*l.* the stock of *A* is the third number, which makes the stating, which being worked according to rule, the answer gives *A* 69*l.* for his share. Then 'tis again repeated, and then the stock of *B* 320*l.* is the third number; and after working the second stating, there arises 96*l.* for the share of *B* in the *gain*, which two shares being added together, make the total *gain*, viz. 165*l.* and is a sure proof the work is right, and that each person had his just proportion of the profit.

Example 2.

Three persons *A*, *B*, and *C* join in Company; *A*'s money in stock is 750*l.* *B*'s 460*l.* and *C*'s 500*l.* and after a certain time, when they settle their accounts, find their neat profit 684*l.* What must each have of the *gain*?

$$\begin{array}{r}
 750\textit{l.} \\
 460 \\
 500 \\
 \hline
 \end{array}$$

$$\begin{array}{rcl}
 \text{If } 1710\textit{l. gain } 684\textit{l. what } 750\textit{l. An. l.} & 300 & A \\
 \text{If } 1710 \text{ gain } 684, \text{ what } 460? & 184 & B \\
 \text{If } 1710 \text{ gain } 684, \text{ what } 500? & 200 & C \\
 \hline
 \end{array}$$

Proof. l. 684

Example

Example 3.

Admit four persons make a joint adventure to sea. *A* sends 68*l.* in Tobacco, *B* 80*l.* in Cloth, *C* 120*l.* in Leather, and *D* 140*l.* in Silk Hose; and after they have disposed of their returns, their neat profit amounts but to 72*l.* what is each man's share of the said 72*l.*?

l. s.

If 400 <i>l.</i> gain 72 <i>l.</i> what 68 <i>l.</i> ?	Answ. <i>A</i> 10—16
If 400 gain 72 what 80?	<i>B</i> 14—08
If 400 gain 72 what 120?	<i>C</i> 21—12
If 400 gain 72 what 140?	<i>D</i> 25—04
	<i>l.</i> 72 00

The common way of having so many statings and workings, as there are partners in the concern, being intolerably tedious, I have here set down a much more compendious method of working sums belonging to this rule; and tho' it is derived from *Decimals*, yet it will well enough answer our end by *Vulgar Operation* which is this: Annex a cypher, or cyphers, to the middle number; (except it be big enough to divide without, which very rarely is) and then divide it by the first number or total sum of the stocks; and then, by that quotient multiply each person's particular stock, and the products will be each man's proportional share in the *gain* or *loss*. But you must observe, that when you have multiplied each person's particular stock by the quotient aforesaid, you must point, or strike off to the right hand, so many figures or cyphers as you annex cyphers to the sum to be divided.

Or *Examples* in this rule may be shorten'd by finding the proportional *Gain* or *Loss* of one pound; thus: Bring the *Gain* or *Loss* into pence, and divide those pence by the total of the stocks, and the quotient shews what it is *per* pound; and then the answers may be found by the rules of *Practice*, etc.

Example

Example by the said proposed method.

For a specimen, let us take the first *Example* in this rule, where the sum of the stocks was 550*l.* and the total gain 165*l.* Here I cannot divide 165 by 550; wherefore I join a cypher to 165 thus, 1650; and then divide it by 550, and the quotient is 3; by which I multiply 30*l.* the stock of *A* and it produces 690; and the cypher on the right-hand being pointed off, for the cypher annexed to the Dividend, there is left 69*l.* for *A*'s share in the gain. Then I multiply *B*'s stock, 320*l.* by the said quotient 3, and the product is 960; then cutting off the cypher, there remains 96*l.* for *B*'s share, &c. which are the same answers as by the other way.

The 2d *Example* worked by this shorter way.

<i>A</i> 750	}	The Gain is 684 <i>l.</i>
<i>B</i> 460		
<i>C</i> 500		

1710) 6840(4 the common Multiplier.
6840

(0)

750 *A*'s stock.

4

l. 300|0 *A*'s share of the gain. ——— *l.* 300

460 *B*'s stock.

4

l. 184|0 *B*'s share of the gain. ——— *l.* 184

500 *C*'s stock.

4

l. 200|0 *C*'s share of the gain. ——— *l.* 200

Proof, *l.* 684

The

The third *example* by the shorter method stands thus:

<i>l.</i> Parts.		<i>i.e.</i>	<i>l.</i>		or	
10	8	$\left. \begin{array}{l} 10 \\ 14 \\ 21 \\ 25 \end{array} \right\}$	10	Eight tenths of a <i>l.</i>	$\left\{ \begin{array}{l} 16 \\ 8 \\ 12 \\ 4 \end{array} \right.$	
14	4		14	Four tenths of a <i>l.</i>		
21	6		21	Six tenths of a <i>l.</i>		
25	2		25	Two tenths of a <i>l.</i>		
Fac. <i>l.</i> 72	0		72			00

Example 4.

Divide *l.* 5760-10 among several persons, so that *A* may have $\frac{1}{2}$, *B* $\frac{1}{3}$, *C* $\frac{1}{4}$, *D* $\frac{1}{5}$, and *E* $\frac{1}{6}$, and tell me each man's part.

In this, and such like cases, take a number out of which such parts may be taken; and take the like parts of that number, to find the numbers you seek, viz. each man's just proportion, &c. See the following works and answers.

20s. Then say, If 27s. 6d.--5760*l.* 10s. what 10s. etc.

$\frac{1}{2}$	10	0	Remainders		2094	14	06	<i>A</i>
$\frac{1}{3}$	6	8	18		1396	09	08	<i>B</i>
$\frac{1}{4}$	5	0	12		1047	07	03	<i>C</i>
$\frac{1}{5}$	3	4	9		698	04	10	<i>D</i>
$\frac{1}{6}$	2	6	6		523	13	07	<i>E</i>
		21					2	
	27	6	—					
	12	33	066	0(2d,	Prin.	5760	10	00
		330						

Example 5.

In like manner may be done that question so often critically proposed, viz. of dividing 20s. into $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$ parts. See the following work.

$$\begin{array}{r} \frac{3}{4} \\ \hline 12 \text{ If } 342d. \text{ pay } 20s. \text{ what } 120d. \text{ etc.} \\ \frac{5}{60} \\ 6 \text{ If } 342 \text{ pay } 20, \text{ what } 90, \text{ \&c.} \end{array}$$

Common 360 Denominator.

		s.	d.	parts.
$\frac{1}{2}$ $\frac{1}{3}$ $\frac{1}{4}$ $\frac{1}{5}$ $\frac{1}{6}$	of 360	120	7	0—72
		90	5	3—54
		72	4	2—180
		60	3	6—36

1st Numb. 342 20 0—342 makes 1 to carry, because
the Rule of 3— (is equal to the divid. 342.

Example 6.

Suppose a *Bankrupt's* money and effects amounts to 811*l.* 10*s.* and he owes to several persons as follows, viz.

To Mr Cruel	—	l. 220	16	6
Mr Gripe	—	312	00	0
Mr Hard	—	117	12	6
Mr Covet	—	106	12	6
Mr Near	—	200	06	0
Mr Squeeze	—	124	12	6
		l. 1082	00	0

How much must each person have of the above-mentioned 811*l.* 10*s.* in proportion to his debt?

l. l. s. l. s. d.
If 1082—811 10, what 220 16 6?

Ans. l. 165 12 4 $\frac{1}{2}$
Or

Or nearer, by seeing first, what it comes to in the pound, (as mentioned in page 235) and then work each particular sum by *Practice*. Thus bring 811/. 10s. into pence, and then divide them pence by 1082, the pounds that are owing, and the quotient shews what it is in the pound, viz. 15 shillings. Then proceed for further solution thus:

What comes l. 220 16 6 to at 15s. per pound?

l. 220 16 6 at 15s. per l.

$$\begin{array}{r} 10 \overline{) 110} \\ 5 \overline{) 55} \end{array} \quad \begin{array}{r} 110 \\ 55 \end{array}$$

12 4 $\frac{1}{2}$ for the 16s. 6d.

Ans. l. 165 12 4 $\frac{1}{2}$

And so of the rest, see the following answer. Or shorter by taking $\frac{1}{4}$ of each person's debt, because 15s. is $\frac{1}{4}$ of a pound.

Mr Cruel must have	—	l. 165	12	4 $\frac{1}{2}$
Mr Gripe	—	234	00	0
Mr Hard	—	88	04	4 $\frac{1}{2}$
Mr Covet	—	79	19	4 $\frac{1}{2}$
Mr Near	—	150	04	6
Mr Squeeze	—	93	09	4 $\frac{1}{2}$

Proof, l. 811 10 0

With time.

When this rule hath any relation to a particular time, then you must multiply each man's particular stock of money by the respective times it continues in the joint-stock, and add all the products together; which total must be the first number in the *Rule of Three*; the gain or loss the second, and each man's stock multiplied by his time the third; and then work

as before, and as often repeat as there are partners, &c.

Example 1.

A and *B* enter into company, *A* puts into stock 120*l.* for 7 months; and *B* puts 230*l.* for 10 months; and in trading they gain 100*l.* what is each man's share, in proportion to his stock and time? See the work following.

120*l.* *A*'s stock.

230*l.* *B*'s stock.

7 Months, *A*'s time.

10 Months, *B*'s time.

840 *A*'s stock and time.

2300 *B*'s stock and time.

2300

If 3140---gain 100*l.* what 840, *A*'s stock and time.

Again,

✱ If 3140--- gain 100*l.* what 2300, *B*'s stock and time.

Parts.

Answer { *l.* 26 15 06 $\frac{1}{2}$ 1660 *A*
73 04 11 $\frac{1}{2}$ 1480 *B*

Proof, *l.* 100----- 3140 *A* Far.

Or the answers may be known by finding a common multiplier, as directed in page 235; or by finding the proportional part of the gain due to one pound, as mentioned in the same page.

Example 2.

Three persons enter into partnership, viz. *A*, *B*, and *C*. *A* puts into stock 65*l.* for 8 months, *B* 78*l.* for 12 months, and *C* 84*l.* for 6 months, and they gain 166*l.* 12*s.* what is each man's share, &c.?

A's Stock multiplied by 8 produces 520

B's Stock multiplied by 12 gives 936

C's Stock multiplied by 6 produces 504

1960 Sto, & 11.

Then

Then say,

S. and T. l. s. l. S. and T.

If 1960 gain 166 12 (or 166,6) what 520?

Answer 44*l.* 4*s.* (or 44,2) &c.

C H A P. XIV.

B A R T E R.

BARTER, or *TRUCK*, is no more than exchanging one commodity for another, and so to proportion their rates, as that neither of the persons may sustain loss.

Example 1.

Suppose *A* has 144 ells linnen cloth, worth 15*d.* per ell, which he would *Truck* with *B* for butter, at 18*s.* 9*d.* per 100*lb.* how many pounds of butter must *B* give *A* for the linnen?

Answer 960 pounds.

The concisest way to answer questions in this rule, is first to find the value of the first goods mentioned, by the shortest way of *Practice*; and then to answer it by the *Rule of Three*.

$$15d. \text{ is } \frac{1}{8} \text{ of a } l. \quad \left\{ \begin{array}{l} 4)144 \text{ ells, at } 15d. \\ \hline 4)36 \\ \hline l. 9 \text{ or } 180s. \end{array} \right.$$

Then say,

If 18*s.* $\frac{3}{4}$ give 100*l.* what 180. &c.

Answ. 960 pounds.

Y

To

To prove the work, cast up the 960 lb. at 2d. $\frac{1}{4}$ per lb. (for so much it is *per* lb. at 18s. 9d. *per* 100 lb.) and if it amounts to 9l. the value of the linnen, the work is right. Thus:

2d. $\frac{1}{4}$ of a l.

$\frac{1}{4}$, or $\frac{1}{4}$ of 2d.

96,0 at 2d. $\frac{1}{4}$ per lb.	96,0
	8
	1
	9 facit.

Example 2.

A has broad cloths at 10l. 10s. *per* piece, and *B* hath mace, at 12s. *per* lb. how many pounds of mace must *B* give *A* for 24 broad cloths? Ans. 420 pounds.

24,0
12
—

If 12s.—1 lb. what 252 lb. &c.

Example 3.

A hath 14C. weight of sugar at 6d. *per* lb. for which *B* gave him 1C. $\frac{3}{4}$ of Cinnamon, what was the Cinnamon rated *per* lb.

14
14
14
14
—

112
84

If 196

6d. $\frac{3}{4}$ of l. 156,8

Cost l. 39,4 what 1 lb.

Ans. 4s.
Ex

Example 4.

per
lb.)
the

lb.

A and *B* barter, *A* hath 86 gallons of brandy, worth 9s. 2d. per gallon ready money, but in barter he will have 11s. per gallon: *B* hath serge worth 2s. 1d. per yard ready money. *Quere*. How many yards of serge must *B* give *A* for his 86 gallons of brandy?

The Rule. First find what advance *B* ought to make per yard for his serge, in proportion to what *A* hath done upon a gallon of his brandy. Thus:

If 9s. 2d. increase to 11s. what must 2s. 1d. increase to?

Ans. 2s. 6d.

d B
ace
ads.

Then see by practice what *A*'s brandy comes to at 11s. per gallon, which will be found to amount to 47l. 6s. then say by the *Rule of Three*.

s. d.	Yard.	l. s.
-------	-------	-------

If 2 6 buy 1 what will 47 6s. buy?

Ans. 378 Yards $\frac{1}{2}$.

And so of any other *example* in this rule of this kind.

for
the

CHAP. XV.

INTEREST.

4s
Ex-

IS an allowance of the borrower to the lender, in consideration of the use made of the lender's money; and therefore interest sometimes is called use money; and therefore interest sometimes is called use money, and this *Interest* is either *Simple* or *Compound*. *Simple Interest* is that which cometh of the *Principal* only; and *Compound Interest* is that which arises from *Principal* and *Interest* also, and is therefore called

Interest upon Interest; but this latter being accounted very unlawful, is seldom allowed, but in some particular agreements, &c. I shall therefore not insist upon it; but as to the former, to wit, *Simple Interest*, I shall endeavour at some practical rules and methods to render it easy to the meanest capacity; and shew also, that by the methods of working *Interest*, several other useful things are answered, that do not come under that denomination.

Example 1.

What comes the interest of a bond of *l.* 374-12-9 to, at 6 per Cent. for a year?

Rule, Multiply the principal money, by the rate of *Interest*, be it what it will, and divide by 100. State it thus:

l. l. l. p. s. d.
If 100*l.* gain 6, what 374 12 9

22|47 16 6
20

9|56
12

6|78
4

3|12

l. s. d.
22 9 6 $\frac{1}{2}$ $\frac{11}{100}$.

Here I multiply the third number by the second, according to *Multiplication of Money*, and the product is *l.* 2247 16 6, which I divide by 100, by cutting off two figures with a dash of the pen, which is dividing by 100, according to the 6th rule of the 5th chapter, then I multiply the several remainders by 20, by 12, and by 4, and still divide by 100, as before, and the answer is *l.* 22-9-6 $\frac{1}{2}$ $\frac{11}{100}$; as may be seen by the work

work above. And the truth may be proved by stating and working it back again thus:

l.p. *s.* *d.* *l.l.* *s.* *d.* *l.p.*
If 374 12 9 gain 22 9 $6\frac{1}{2}\%$, what 100?

Example 2.

What's the interest of $l. 826\ 13\ 9$, for a year, at 5 per Cent.

Shorter thus:	4133	8 9	
$\frac{1}{2}$ 8216 13 9	20		
<i>Fac.</i> $l. 4116\ 08\ \frac{1}{2}$	6168		
	12		
	8125		
	4		
	1100		
		$l. 41\ 6\ 8\ \frac{1}{2}$	

In the shorter method, I consider that the rate of Interest, viz. 5 per Cent. is the 20th part of 100/. wherefore I take that part of the principal money, which is done only by halving it, thus: The $\frac{1}{2}$ of 8 is 4, and the $\frac{1}{2}$ of 2 is 1, or 41/. and the 6 cut off is (for the cypher in $\frac{1}{2}$) 6s. and the 13s. 9d. reduced into pence by your head or pen, makes 165, and supposing the 5 cut off, the $\frac{1}{2}$ of 16 is 8 pence; and 5 reduced into farthings make 20, and supposing the 0 to be cut off from that likewise, the $\frac{1}{2}$ of 2 is $\frac{1}{2}$, and so the answer is the same with the other, viz. $l. 41-6-8\frac{1}{2}$; and the most concise method that can be.

Example 3.

What's the Simple interest of
 l. 34|8 13 2 at 6 per Cent?

$$\begin{array}{r}
 17 \quad 08 \quad 7 \frac{1}{2} \quad \left. \begin{array}{l} \frac{1}{2} \text{ for 5 per Cent.} \\ \frac{1}{4} \text{ for 1 per Cent.} \end{array} \right\} \\
 3 \quad 09 \quad 0 \frac{3}{4} \\
 \hline
 \text{Facit l. } 20 \quad 18 \quad 4 \frac{1}{2}
 \end{array}$$

Example 4.

What's the interest of l. 746-12-6, at $5\frac{1}{2}$ per C.

$$\begin{array}{r}
 5 \\
 \hline
 3733-02-6 \\
 \text{The } \frac{1}{2} \text{ of } 746\text{l. etc. } 373-06-3 \\
 \hline
 41|06-08-9 \\
 20 \\
 \hline
 1128 \\
 12 \\
 \hline
 3145 \\
 4 \\
 \hline
 1180
 \end{array}$$

Sooner thus:

$$\begin{array}{r}
 746 \quad 12 \quad 6 \\
 \hline
 \frac{1}{10} \left| \begin{array}{r} 37 \quad 06 \quad 5\frac{1}{2} \\ 3 \quad 14 \quad 7\frac{1}{2} \end{array} \right. \\
 \hline
 \text{l. } 41 \quad 01 \quad 3\frac{1}{2} \text{ Facit.}
 \end{array}$$

l. 41 01 3½

Thus by either of these ways may the interest of any sum of money, for a year, be found, at any rate, *per Cent.* Likewise by the same method of working, may the provision, commission, or factorage of any sum be known: As also insurance, average, storage, brokerage, or any thing else, rated at so much *per Cent.*

What

What is the factorage of goods bought, or otherwise negociated, to the value of $l. 479 \ 16 \ 9$ at 2 per C.

$$\begin{array}{r} 479 \ 16 \ 9 \\ 20 \overline{) 959 \ 13 \ 6} \\ 20 \end{array}$$

Or thus:

$$2 \text{ per Ct. } \frac{1}{50} \overline{) 479 \ 16 \ 9}$$

$$\begin{array}{r} 11 \ 93 \\ 12 \end{array}$$

$$\text{Facit, } l. \ 9 \ 11 \ 11$$

$$\begin{array}{r} 11 \ 22 \\ \text{Answ. } l. \ 9 \ 11 \ 11. \end{array}$$

What is the insurance of 230*l.* at $10\frac{1}{2}$ per Cent.
 $l. 2300 \longrightarrow 10 \text{ per Cent.}$

$$\begin{array}{r} 115 \\ 57 \ 10 \\ 24 \overline{) 72 \ 10} \\ 20 \\ \hline 14 \overline{) 50} \\ 12 \\ \hline 6 \overline{) 00} \end{array}$$

Or thus:

10 per Cent. $l. \ 23 \ 0$

$$\begin{array}{r} 10s. \ \frac{1}{2} \overline{) 1 \ 3} \\ 5 \ \frac{1}{2} \overline{) 11 \ 6} \\ \hline l. \ 24 \ 14 \ 6 \end{array}$$

This method may be of good use, for taking off 5 per Ct. for prompt payment in custom-house duties, and 15 per Ct. the additional duty on French and East-India goods.

Admit I were to take off 5 per C. from $l. 275 \ 12$

$$\text{Subtract } \frac{1}{20} \overline{) 13 \ 15 \ 07}$$

$$\text{Answer } l. \ 251 \ 16 \ 05$$

Again, take off 15 per Cent. from $l. 672 \ 16 \ 08$

$$\begin{array}{r} \frac{1}{20} \overline{) 67 \ 05 \ 08} \\ \frac{1}{2} \overline{) 33 \ 12 \ 10} \end{array}$$

$$\text{Subtract } 100 \ 18 \ 06$$

$$\text{Answer } l. \ 571 \ 18 \ 02$$

Once

Once more, take 25 p. Ct. from $l. 321\ 12\ 4$

$$\begin{array}{r} 5 \text{ per Cent. } \frac{1}{20} \ 16 \ 01 \ 7\frac{1}{2} \\ \hline 5 \end{array}$$

Deduct. $80\ 08\ 0\frac{1}{2}$ 25 p. C.

Ans. $l. 241\ 04\ 3\frac{1}{2}$

Example 5.

What comes the interest of $l. 446\ 12$ to, for 9 months, at 6 per Cent. per annum?

Here I take the $\frac{1}{2}$ of the year's interest for 6 months, and then the $\frac{1}{2}$ of that for 3 months, and add them together for 9 months, as in the following work.

$l. 446\ 12$

6 per Cent.

$$\begin{array}{r} 26|79\ 12 \\ 20 \\ \hline \end{array}$$

$$\begin{array}{r} 15|92 \\ 12 \\ \hline \end{array}$$

$$\begin{array}{r} 11|04 \\ \hline \end{array}$$

$l. 26\ 15\ 11\frac{1}{100}$ for a year.

6 months--- $13\ 07\ 11\frac{1}{2}$ for $\frac{1}{2}$ a year.

3 months--- $6\ 13\ 11\frac{1}{4}$ for $\frac{1}{4}$ ditto.

$l. 20\ 01\ 11\frac{1}{4}$ for 9 months

Example 6.

To what comes the interest of $l. 297\ 12$, at 5 per C. for 6 months?

Answer $l. 7\ 8\ 9\frac{1}{2}$.

$l. 14\ 17\ 7$ for a year.

Take $\frac{1}{2}$ for $\frac{1}{2}$ $l. 7\ 08\ 9\frac{1}{2}$ Answer.
6 Months. $\frac{1}{2}$

When

When at any time the rate of interest hath $\frac{1}{2}$, $\frac{1}{3}$, or $\frac{1}{4}$ annexed, you must first multiply by the whole numbers, and then take $\frac{1}{2}$, $\frac{1}{3}$, or $\frac{1}{4}$, of the principal money, (as is taught in the 13th rule of the 4th chapter) and add the two lines together, and then divide by 100, as before.

Example 7.

What is the interest of $l. 376 \ 12 \ 6$
at $1.4\frac{1}{2}$ per Cent. ?

For the $\frac{1}{2}$ per Cent. take }
half of the principal. }

1506	10	0
188	06	3

16	94	16	3
	20		
18	96		
	12		
11	55		
	4		
2	20		

Answer $l. 16-18-11\frac{1}{2}$

Example 8.

What is the interest of $l. 226 \ 10$
at $4\frac{1}{2}$ per Cent.

p. Ct. }
 $\frac{1}{2}$ }
 $\frac{1}{2}$ }

679	10	0
113	05	
56	12	6

8	49	07	6
	20		
9	87		
	12		
10	50		
	4		
2	00		

Ans. $l. 8-9-10\frac{1}{2}$

Another

Another way (when the time is odd, or not just a year) is to multiply the principal by the interest of 100/. for the nominated time, cutting off two figures to the right-hand; as before,

Example 1.

What's the interest of l. 234 12 6 for 2 years, at 5 per Cent. The int. of 2 yrs. at 5 per Cent. } 10/.

$$\begin{array}{r}
 234 \overline{) 46050} \\
 \underline{20} \\
 9 \overline{) 25} \\
 \underline{12} \\
 3 \overline{) 00}
 \end{array}
 \left. \vphantom{\begin{array}{r} 234 \overline{) 46050} \\ 9 \overline{) 25} \\ 3 \overline{) 00} \end{array}} \right\} 1.2393$$

Example 2.

What's the interest of l. 312 16 for 5 years, at 6 per Cent. 5 and 6

$$\begin{array}{r}
 156400 \\
 \hline
 93 \overline{) 840} \\
 \underline{20} \\
 16 \overline{) 80} \\
 \underline{12} \\
 9 \overline{) 60} \\
 \underline{4} \\
 2 \overline{) 40}
 \end{array}
 \left. \vphantom{\begin{array}{r} 156400 \\ 93 \overline{) 840} \\ 16 \overline{) 80} \\ 9 \overline{) 60} \\ 2 \overline{) 40} \end{array}} \right\} \text{Answ. l. } 93 \text{ } 16 \text{ } 9\frac{1}{2}$$

Here the interest of 100/. for the time, is 30/. therefore I multiply by the ratio's of 30, viz. 5 and 6; as in the example.

Example

Example 3.

What's the interest of $l. 428-14$, for 9 mon. at 4 per Cent. $\frac{1}{2}$ is 3l. (Ct. for 9 mon. at 4 per Ct. $\frac{1}{2}$)

$$\begin{array}{r} 12 \overline{) 862} \\ \underline{20} \\ 17 \overline{) 22} \\ \underline{12} \\ 2 \overline{) 64} \\ \underline{4} \\ 2 \overline{) 56} \end{array} \left. \vphantom{\begin{array}{r} 12 \overline{) 862} \\ 17 \overline{) 22} \\ 2 \overline{) 64} \\ 2 \overline{) 56} \end{array}} \right\} l. 12-17-2 \frac{1}{2}$$

When the rate is at $\left\{ \begin{array}{c} 5 \\ 6 \\ 4 \\ 3 \end{array} \right\}$ per Cent. for $\left\{ \begin{array}{c} 12 \\ 10 \\ 15 \\ 20 \end{array} \right\}$ Months.

Then the interest of any principal, is just so many shillings as there are pounds; therefore only take $\frac{1}{10}$ of the principal, &c.

Example 1.

What's the interest of — $l. 412 \ 06 \ 9$ at 5 per Cent. for 12 months?

$$\frac{1}{10} 20 \ 12 \ 4 \frac{1}{10} \text{ Ans.}$$

Example 2.

What's the interest of — $l. 324 \ 12 \ 0$ at 6 per Cent. for 10 months?

$$\frac{1}{10} 16 \ 04 \ 7 \frac{4}{10} \text{ Ans.}$$

Example

Example 3.

What's the interest of—*l.* 428 16 4 at 4 per Cent. for 15 months?

$$\begin{array}{r} \frac{1}{30} \quad 21 \quad 08 \quad 9\frac{3}{4} \text{ Answ.} \\ \hline \end{array}$$

Hence it necessarily follows, that the interest of any given principal may be found, by taking parts for the time proposed, out of the time mentioned in the fore-going table; thus: If the interest of *l.* 412-6-9 for 12 months, be 20*l.* 12*s.* 4*d.* $\frac{1}{2}$, as in page 251, at 12*d.* in the pound, then for 6 months it must be $\frac{1}{2}$, viz. 10-6-2 $\frac{1}{4}$; and for three months $\frac{1}{4}$.

Examples.

What's the interest of—20)276 05 9 for 4 months at 5 per Cent.

$$\begin{array}{r} 13 \quad 16 \quad 3\frac{1}{2} \\ \hline 4 \text{ months } \frac{1}{3} \text{ of } \} \\ 12 \text{ months. } \} \quad \underline{\underline{l. \quad 4 \quad 12 \quad 1 \text{ Answ. for 4 M.}}} \end{array}$$

Again, what's the interest of 20)157 09 0 for 5 months, at 6 per Cent.

$$\begin{array}{r} 7 \quad 17 \quad 5\frac{1}{4} \\ \hline 5 \text{ months } \frac{1}{2} \text{ of } \} \\ 10 \text{ months. } \} \quad \underline{\underline{l. \quad 3 \quad 18 \quad 8\frac{1}{2}}} \end{array}$$

And so for 4 or 3 per Cent. for 15 or 20 months, in the same manner.

When the *Principal Money* is any number of pounds, without shillings or pence, then it may be done by the following method of working.

Example.

Example.

What's the interest 40*l.* for 7 years, 5 months, and 26 days, at 6 per Cent. per annum?

Years. Mon. Days.

7 5 26

12 Months in a Year.

89

30 Days in a month.

2696

40 Principal Money.

1|00)1078|40

Groats 6|0)107|8
in all.

l. 17 58 Groats, or 19*s.* 4*d.* and 1*d.* $\frac{1}{2}$ for
(the fraction.

Here the time is set down, and multiplied by 12, the calendar months in a year, and the odd months taken in, and then by 30, the supposed days in a month, and the odd days taken in likewise, which product of days, is multiplied by the principal money, viz. 40*l.* which product is divided by 100, and then that quotient by 60, the groats in a pound, and the remainder is groats, viz. 58, which is 19*s.* 4*d.* and 1*d.* $\frac{1}{2}$ for the fraction, in all, l. 17-19-5 $\frac{1}{2}$: As in the work.

Example.

What is the interest of 590*l.* for 3 years, 7 months, and 19 days, at 6 per Cent. per annum?

Z

Years.

Years. Mon. Days.

3	7	19
12 Months in a Year.		

43
30 Days in a Month.

1309
590 Principal Money.

117810
6545

100)7723 10
60)772 3

Anfw. l. 128 43 groats, or 14s. 4d.

In all, l. 128-14-4

There is also another way of calculating *Interest*, by days, which is thus: Bring the principal money into pence, then multiply these pence by the days it is out at interest, and if the rate be at 6 per Cent. then divide by 6083, which is what is produced by the days of a year multiplied by 100. and divided by the rate of interest; but if the rate be 5 per Cent. then divide by 7300.

Example.

What is the interest of 150l. for 10 months and 24 days, at 5 per Cent. per annum?

150l.

l. 150	Mo. Days.
20	10—24
	30
3000	
12	324
	—12)
36000	73 00)116640 00(1597
324 days at interest:	1313—1
144000	Ans. l. 6-13-1
72000	
108000	
11664000	

Another Rule by Days.

Multiply these three numbers continually, viz. the given interest of 100*l.* for a year; the principal whose interest is required: And lastly, the number of days, required; and the last product is to be reserved for a dividend. Then multiply 365 days by 100, (which is only annexing two cyphers) and let that product be your divisor; (which serves for all rates) and then divide as usual, and the quotient will be the interest sought.

Note here, That the two principals, viz. 100*l.* and the other proposed, are supposed to be of one denomination: also the interest required will be of the same name with the given interest of 400*l.*

Example.

What is the interest of 400*l.* for a week, or 7 days. at 6 per Cent. per annum?

Z 2

365

$$\begin{array}{r}
 365 \\
 100 \\
 \hline
 36500 \text{ Divisor.}
 \end{array}
 \qquad
 \begin{array}{r}
 400 \\
 6 \\
 \hline
 2400 \\
 7 \\
 \hline
)16800(\text{ Dividend.}
 \end{array}$$

$$36500)16800,000(.4602 \text{ or } 9s. 2d. \frac{1}{4}.$$

Answ.

Here in valuing, the farthings are always lessened by one.

When the rate is *5s. per Cent.* take the $\frac{1}{4}$ of the principal, and work as before.

What is the brokerage of *l. 465 12 6*
at *10s. per Cent.*

Answ. *l. 2-6-6* $\frac{1}{4}$

$$\begin{array}{r}
 \frac{1}{4} 2|32 \quad 16 \quad 3 \\
 \hline
 20 \\
 \hline
 6|56 \\
 12 \\
 \hline
 6|75 \\
 4 \\
 \hline
 3|00
 \end{array}$$

If you would know what any sum comes to, at 30, 40, or 50 *per Cent.* first see what it comes to at 10 *per Cent.* and then multiply that answer by 3, 4, or 5, &c.

Example

Example.

What comes *l.* 726 10 6 to *1* at 40 per Cent.

$$\begin{array}{r}
 10 \\
 \hline
 72 \overline{) 65950} \\
 \underline{49} \\
 1305 \\
 \underline{12} \\
 60 \\
 \underline{4} \\
 240
 \end{array}$$

l. 72-13-0 $\frac{1}{2}$ 10 per C. 20

4

l. 290-12-2 Answ. 12

60

4

240



CHAP. XVI.

DISCOUNT.

IS when a sum of money hereafter due, is satisfied by paying down so much present money, which is put to interest (at such a rate, and for such a time) would increase itself to the sum first due.

Example 1. What is the *Discount* of *l.* 487-12 for 6 months, at 6 per Cent. per annum?

To answer this, and other sums of the same kind, the general rule is to make 12 months the first number in the *Rule of Three*, the rate of *Interest* the second, and discounted time the third.

If 12 months give 6*l.* what 6 months?

$$\begin{array}{r}
 6 \\
 \hline
 12 \overline{) 36}
 \end{array}$$

3 To be added to 100*l.* the first number

Z 3

number in the next work. Then say again. If 303 l. abate 3 l. what l. 487-12.

Ans. l. 14-4 Discount.

See the following Proof.

After I find the discount to be l. 14-4, I deduct it from the sum first due, viz. l. 487-12, and the remainder is the present money to be paid down: And for the proof of the assertion in the first rule, I take the sum to be paid down and calculate it at 6 per Cent. the rate of the interest, proposed, and the answer is l. 28-8, the interest for a year; the half of which for 6 months, (the time discounted) is l. 14-4, the discounted sum. As by the following work.

l. 487 12 first due
14 04 discounted

From whence it is manifest, no one allows interest for any more money than he receives.

473 08 to pay down
6 per Cent.

28 | 42 0
20

8 | 40

Interest for a year l. 28 8

$\frac{1}{2}$ for 6 months, l. 14 4 Proof.

Example 2. What is the discount of 275 l. 10 s. for 7 months, at 5 per Cent. per annum?

5 l. per Cent.

6 months $\left| \frac{1}{2} \right|$ 2 10
1 month $\left| \frac{1}{8} \right|$ 0 08 4

l. 2 18 4

If l.

If £. 102-18-4 abate £. 2-18-4, what £. 275-10?

Answ. £. 7-16-1

First due, £. 275-10

Discounted, 7-16-1

Paid down, 267-13-11

5p.6.

l. s. d.
 Interest 13 7 8½

 6 Mo. ½ 6-13-10
 1 Mo. ⅙ 1-02-03

 Proof. 7-16-01

12|38-09-07
 20

 7|69
 12

 8|35
 4

 1|40

Example.

Bought goods to the value of £. 109-10 on 9 months discount, at 6 per Cent. per ann. what must be paid down?

6l. per Cent.

6 Months ⅙ 3 00
 3 Months ⅙ 1 10

 4 10
 100

If 104 10 abate £. 4 10, what 109 10?

Answ. 4-14-3

4 14 3

Answer, to be paid down, £. 104 15 9

Example.

Example 4.

Sold goods amounting to *l.* 217-12, on two 3 months discount, (that is, half at 3 months, and the other half 3 months after that) at 5 *per Cent.* *per annum*, what must be paid down?

5 *per Cent.*

		If 101-05 abate <i>l.</i> 1-5, wt. 108-16	
3M. $\frac{1}{4}$	1 5	Answ. <i>l.</i> 1-06-10 Disc.	
	100 5	1. 217-12	
	101 5	108-16	
		} 2 parts,	

Again.

If 102-10 disc. *l.* 2-10, wt. *l.* 108-16

Answ. *l.* 2 13 0 Disc.

217-12 val. sold.

5 *per Cent.*

		<i>l.</i> 108 16 for 3 m.	1 06 10 Disc.
6 M. $\frac{1}{2}$	2 10	108 16 for 6 m.	2 13 00 Disc.
	100 00		
		Total discount,	3 19 10
	102 10		
		Paid down, <i>l.</i> 213 12 02 Ans.	

In the foregoing example, I first divide the given sum into two equal parts, by taking the half of it; then for 3 months, I take $\frac{1}{4}$ part of the rate, viz. 5 *per Cent.* and it makes it *l.* 5s. Then I add that facit to 100*l.* and make the first *Stating*, saying, If *l.* 101-5 discount *l.* 1-5, what *l.* 108-16? and the answer is *l.* 1-6-10, for the first 3 months discount. Then for 6 months I take the $\frac{1}{2}$ of the rate, and it makes *l.* 2-10: Then I say again, if *l.* 102-10 abate *l.* 2-10, what *l.* 108-16? and the answer is *l.* 2-13 for 6 months discount. Then I add the two discounts together, and subtract the total from the sum first due, and the remainder is *l.* 213-12-2 to be paid down presently. Which may be seen by the work.

When

When the payments are to be made at three several times, then divide the given *sum* into three equal parts, and work as before; and if at 4 payments, then divide the sum into 4 equal parts, &c.

There is another and better way, when the rate is at 6 per Cent. Discount, which is thus:

Bring the given sum into pence, and then multiply those by the time, which product divide by 200 and the time added together, and the quotient will be the answer in pence, which reduce into pounds, &c.

Example 5.

For trial, let us take the first example in this rule, viz.

What is the Discount of l. 487 12
for 6 months, at 6 per Cent.

$$\begin{array}{r}
 \begin{array}{r}
 200 \\
 6 \\
 \hline
 \text{Divisor, } 206 \\
 \hline
 \end{array}
 \begin{array}{r}
 9752 \\
 12 \\
 \hline
 117024 \text{ pence.} \\
 6 \text{ months time.} \\
 \hline
 206)702144(3408 \text{ pence.} \\
 618 \\
 \hline
 12)3408 \text{ pence.} \\
 28 \overline{)4} \\
 \hline
 \text{Discount l. } 14-4 \\
 \hline
 \end{array}
 \begin{array}{r}
 841 \\
 824 \\
 \hline
 1744 \\
 1648 \\
 \hline
 (96) \\
 \hline
 \text{l. } 487 \text{ } 12 \text{ First due} \\
 14 \text{ } 04 \\
 \hline
 \text{Answ. l. } 473 \text{ } 08 \text{ to pay down.} \\
 \hline
 \end{array}
 \end{array}$$

A third

A third way of discount is to multiply 12 months by 100, (which is only annexing two cyphers to 12) and divide the product by the rate of discount, and to that quotient add the time proposed; which sum reserve for a divisor: Then multiply the sum to be discounted by the proposed time, and divide that product by the above-mentioned divisor.

Example 6.

What is the discount of £. 487-12, for 6 months, at 6 per Cent. per Annum, (the first example of this rule?)

	12	Sum to be	£ 487-12
	100	discounted	6
Rate	6	1200	206
			206
	200		
Time added	6		865
			824
Divisor,	206		
			41
			20
Answer, £.	14-45.		
to be discounted.			832(45.
			824
			(8)

Example 7.

What present money will discharge a debt of 122l. 11s. 4d. due at 3 months, discounting after the rate of 6 per Cent. per Annum. Ans. £. 120-15-1 $\frac{1}{2}$.

After the last method of operation.

	l.	s.	d.	
Divisor, 203	367	14	16	2 $\frac{1}{2}$, Discount.
				&c.

Example

Example 8.

What is the discount of l. 275-10, for 7 months, at 5 per Cent. per Annum? Ans. l. 7-16-1 $\frac{1}{2}$.

As before.

l. s. l. s. d.
Divisor, 247)1928 10)7 16 1 $\frac{1}{2}$, Discount.
&c.

For	2	per Cent.	600	with the time added, is the Divisor.
	3		400	
	4		300	
	5		240	
	6	Discount.	200	
	7		171	
	8		150	
	9		133	
	10		120	

When the Discount of any sum is at any of the rates in the table above, viz. from 2 to 10, then the opposite numbers, with the time of Discount added to them, will be proper Divisors for your intended purpose, and are found by dividing 1200 by the rate of Discount; according to the rule of the third method of Discount.

If the Discount be 20, 30, or 40 per Cent. then cut off a cypher from 600, 400, 300, &c. and add the time to 60, 30, or 40, for the Divisor, &c.

Example 9.

What is the discount of l. 212-15, for 3 months, at 40 per Cent. per Annum?

According to rule, I add 3 (the time) to 30, and makes 33 for a Divisor, &c.

212 15
3
33)638 05 (l. 19-6-9 $\frac{1}{2}$ 1 $\frac{1}{2}$, Answer.
&c.

C H A P. XVII.

E X C H A N G E.

IS the receiving of money in one country, or nation, and paying it again in another, value for value, having respect to the several species of coin, or money of each nation.

Exchange of coins is like the business of exchanging or bartering of goods, and depends on a clear understanding of the *Golden Rule*, to find what sum of one country's money will be equal in value to any proposed sum of another country's money: In order to which, it is very necessary to have at all times a true account of the just values of those foreign coins that are to be exchanged, as they are compared in value to our *English*, at all times, as abovesaid, because the *Par* of Exchange differs almost every day from *London* to other countries; that is, it rises and falls, &c.

The way of working *Exchange* is, either by the *Rule of Three*, or by *Practice*, and most commonly by the latter.

London exchanges with *Holland*, *Flanders*, &c. upon so many shillings and pence *Flemish* for the pound *Sterling*; the *Par* being 33s. 4d. *Flemish*.

<i>Dutch Money.</i>			<i>Ster. Val.</i>	
			<i>s.</i>	<i>d.</i>
2 Groats, 1 <i>Stiver</i> ,	_____		0	1
1 <i>Stiver</i> ,	_____		0	1
6 <i>Stivers</i> , 1 <i>Skilling Flemish</i> ,	_____		0	7
20 <i>Stivers</i> , 1 <i>Guilder</i> ,	_____		2	0
6 <i>Guilders</i> 1 pound <i>Flemish</i> of 20s.	_____		12	0
33s. 4d. <i>Flemish</i> , or 10 <i>Guilders</i> ,	_____		20	0
A common <i>Dollar</i> ,	_____		3	9
A <i>Specie Dollar</i> ,	_____		5	0

Examp

Example 1.

Remitted from London to Amsterdam, a bill of Exchange of l 285-10s. Sterl. the exchange at 33s. 9d. Flem. per pound Ster. how many Guilders Flem. must the bill be drawn for? Ans. 2890 Guilders 13 Stivers.

Worked thus:

If 20s. Ster. give 33s. 9d. Flem. what l 285-10 Ster.?

12	20
405	5710
	405
	28550
	228400

$$2|0)231255|0$$

$$2 \text{ Groats } 1 \text{ Stiver } 2)115627-10$$

$$20 \text{ Stivers } 1 \text{ Guilder } 2|0)5781|3$$

$$\text{Answer, } 2890 \text{ } 13$$

When you would know your gain, or how much the exchange is in your favour, subtract the *Par* from the course, or price of the exchange, and the difference is the gain per pound Flemish, as here is but 5d. And so the contrary for loss, &c.

Example 2.

A merchant in Rotterdam remits a bill of Exchange of 7621 Guilders, 7 Stivers, to be paid in London, how much Sterling money must the said bill be drawn for, the exchange at 33s. 4d. Flem. per pound Sterling?

$$\text{Answ. } l. 762 \text{ } 2 \text{ } 8$$

If 33s. 4d. Flem. gives 20s. Sterl. what 7621 7

12	12	20
400	240	152427
		2 groats

304854

240

12194160

609708

4|00)731649|60

12)182912

2|0)1524|2 - 8

Answ. l. 762-02-08

Sterling money may be brought into Flemish money by Practice, thus: consider how much the rate of exchange is above a pound Sterling, which reduced to the parts of a pound, and take those parts of the Sterling money, and add them to the Sterling money, which total multiply by 6, because 6 Guilders, make a pound Flemish, and the product will be the answer

Example.

The answer to the 2d example of Flemish money reduced to Sterling money, is

l. 762 2 08

254 0 10

254 0 10

Here the difference is 13s. 4d. or $\frac{2}{3}$ of a l. wherefore I take $\frac{2}{3}$ of 1.762-2 8, and add the results to it, and it makes 7621 Guilders, 6 Stivers, 8 Pennicks, or 1 Groat; as by the Rule of Three.

1270 4 05

6

Guil. 7621 6 08

Or *Flemish* money may be brought into *Sterling* money, by bringing the course or rate of exchange into pence for a Divisor; and the *Flemish* money into pence likewise for a Dividend; and the quotient will be the answer in *Sterling* money.

Example 3.

For how much *Sterling* money must a bill be drawn, for goods bought in *Holland*, amounting to 11715 *Gul.* 12 *Stivers*, the exchange at 34s. 8d. *Flem.* per pound *Sterling*.

s. d.	Guild.
34 8	11715 12 <i>Stiv.</i>
12	40 <i>Groats.</i>
416 Divis.)	468624 (L. 1126-10s. <i>Sterl.</i>
	(208) Remainder.
	20
	4160 (10s.
	4160

London exchanges with *France* upon the *French* crown, whose *Par* is 54d. that is, to pay so many pence, or shillings and pence, for the *French* crown.

French Money.	Val. <i>Sterl.</i>
	s. d.
12 <i>Deniers</i> 1 <i>Sou.</i>	0 0 $\frac{1}{2}$ $\frac{1}{4}$
20 <i>Sous</i> 1 <i>Livre.</i>	1 6
3 <i>Livres</i> 1 <i>Crown.</i>	4 6

Example 4.

If I draw a bill per Exchange L. 210-17-10 *Sterling*, to be paid in *Paris*, the exchange at 57d. $\frac{1}{4}$, for how many crowns must I draw the bill?

Ans. 886 *Fr.* Gr. 0 *Liv.* 1 *Sou.*
A a 2 If

d. *Fr. Cr.* *l. s. d.*

If 57 $\frac{1}{2}$ ——— 1 ——— what 210 17 10

8 3 *Liv.* 20

—————

457 3 4217

20 *Sous.* 12

—————

60 50614

8 Eights

—————

404912

60 Second number.

—————

457)24294720(53161 *Sous.*

2 *Fr. Crowns* 60 *Sous* 6|0)5316|1

—————

Li. Sous.

Fr. Cr. 886 00 1 *Ans.*

—————

Example 5.

Admit a bill drawn in *Lyons*, and payable in *London* for 1510 crowns, 2 *Livres*, 10 *Sous*, how much *Eng-lish* money comes it to, the exchange at 55*d.* $\frac{1}{2}$?

Ans. *l.* 347-0-4 $\frac{1}{2}$

Again, suppose a merchant in *London* buys goods for another in *Galais*, to the value of *l.* 102-4 *Sterl.* for which he is to draw a bill on him in *Galais*; for how many crowns must the bill be drawn? *Ans.* 438 *Fr. Cr.*

s. *Fr. Cr.* *l. s.*

If 4 $\frac{1}{2}$ ——— 1 ——— 102 4

3 20

—————

14 2044

3

—————

7)6132

—————

2)876

—————

Ans. 438 *Crowns.*

—————

Here the first and third numbers are brought into thirds, and then 1 divide by 7 and 2, the *Ratio's* of 14, &c.

Spanish Money.		Sterl. val.	
		s.	d.
1 Meruid	— — —	0	$0\frac{1}{3}\frac{1}{3}$
34 Meruids 1 Rial (formerly 6d.)	— — —	0	$4\frac{3}{4}$
11 Rials Plate, 1 Ducat	— — —	4	4
10 Rials Plate, 1 Pce $\frac{8}{9}$	— — —	4	0

Example 6. How many Pce $\frac{8}{9}$ at 48d. $\frac{1}{4}$, will answer
 a bill of l. 344-11-8 $\frac{1}{2}$ Sterling? Answ. 1714

Example 7. 24690 Rials Plate, how many Pcs $\frac{8}{9}$,
 and pounds Sterling, the Exchange at 4s. 6d. per
 Pce $\frac{8}{9}$?

Answer. $\left\{ \begin{array}{l} 2469 \text{ Pcs } \frac{8}{9} \\ \text{l. } 555-10-6 \text{ Sterling.} \end{array} \right.$

London exchanges with Portugal upon the Millrea
 of about 5s. 6d. to 5s. 7d.

Portugal Money.		Ster. val.	
		s.	d.
12 $\frac{1}{2}$ Reas	— — —	0	1
1000 Reas 1 Millrea	— — —	6	8
1 Festroon	— — —	1	3

Example 8. How many Millreas must a bill be
 drawn for, to pay l. 125-11-11 $\frac{3}{4}$ Sterl. the exchange
 at 5s. 6d. $\frac{1}{4}$ per Millrea? Answ. 455 Millreas.

If 5s. 6d. $\frac{1}{4}$ — 1 — what l. 125-11-11 $\frac{3}{4}$?

Answer 455.

Example 9. How many pounds Sterling, &c. must
 a bill be drawn for, to answer 500 Millreas, the ex-
 change at 5s. 5d. $\frac{1}{8}$ per Millrea? Answ. l. 136-14-4 $\frac{1}{2}$

Example 10. How many pounds Sterling, etc. must
 a bill be drawn for, to answer 600 Millreas, 550 Reas,
 at 5s. 7d. per Millrea? Answ. l. 167-13-0 $\frac{1}{11}$.

London exchanges with *Venice* upon the *Ducat* of 52*d.* and with *Leghorn* upon the *Dollar*, or *Pcs.* of $\frac{1}{4}$ of 54*d.*

Italian Money.

			Sterl. val.
1 <i>Livre</i> at <i>Leghorn</i>	—	—	5. 0 9
1 <i>Crown</i> current at <i>Florence</i>	—	—	5 3
1 <i>Ducat</i> de <i>Banco</i> at <i>Venice</i>	—	—	4 4
1 <i>St Mark</i> at ditto.	—	—	2 10
1 <i>Palermo Florin</i>	—	—	2 6

When the comparison is made between *Foreign Coins* of one country and another, such questions may be answered by the *Single Rule of Three Inverse*.

Example 11.

How many *Spanish Ducats*, at 4*s.* 4*d.* must be drawn for 700 *Rix-Dollars*, at 5*s.* 6*d.*

If 700 — 5*s.* 6*d.* — 4*s.* 4*d.*

12 12

66 52

700

52)46200(888 $\frac{3}{4}$ Answer.

416..

460

416

440

416

(24)

CHAP. XVIII.

PROFIT and LOSS.

Example 1.

IF I buy 220 yards of broad cloth, at 8s. 6d. per yard, and sell it again at 10s. 4d. per yard, what do I gain by the whole?

First find the difference by *Subtraction*, between the price bought, and the price sold for; then by *Practice* cast up the number of yards by that difference, as underneath.

s.	d.	
10	4	Sold for
8	6	Bought for
1	10	Difference.

220 yards, at 1s. 10d.	Or thus:
8d. $\frac{1}{2}$ 110	220
4d. $\frac{1}{4}$ 73-4	
	22
40 3-4	Subtract $\frac{1}{4}$ 1 16 8

Answ. l. 20-3-4 total gain.

20 03 4

Example 2. If a draper buy 750 ells of *Holland*, for l. 81-5, how must it be sold per ell, to gain, l. 21-17-6 in the whole?

Answ. 2s. 9d.

Here the intended gain must be added to the prime cost, which makes l. 103-2-6. Then say,

If 750 ells cost l. 103-2-6, what 1 ell? And the answer will be 2s. 9d. per ell. And for so much must he sell it per ell, to gain l. 21-17-6 in the whole.

And

And for proof, see by *Practice* what 750 ells come to, at 2s. 9d. and you will find it amount to l. 103 2s. 6d.

Example 3. Admit a merchant to buy goods to the value of 425l. and offers them again for l. 15 per Cent. profit what come they to? *State it thus.*

If l. 100 gain 15, what l. 425

Or thus:

	115
425 at 15 per Cent.	2125
4 hundred under 15 per Cent.	425
	425
60	
25 is $\frac{1}{4}$ of 100l.	488 75
3 15, or $\frac{1}{4}$ of 15l.	20
63 15 Profit	
Add 425-00 prime Cost.	15 00
	Answ. 488-15.

Anf. l. 488-15 What they must be sold for, as before.

Example 4. If I buy 500 pair of silk hose, at 8s. 6d. per pair, how much must I sell them for per pair, to gain 20 per Cent. profit.

First see what they come to at 8s. 6d. per pair; thus

	500 pair at 8s. 6d.
	8
	4000
6d. $\frac{1}{2}$ 250	1250
	4250
	4250
Answer l.	212-10

Then

Then see what l. 212-10 comes to at 30 per Cent.
10 per Cent.

$$\begin{array}{r} 2125-00 \\ 20 \\ \hline \end{array}$$

l. 21-5 10 per Ct.

$$\begin{array}{r} 500 \\ 3 \\ \hline \end{array}$$

30 per Ct. profit, l. 63-15 | Answ.
prime cost, 212-10 | add

$$\begin{array}{r} 1.276-05 \\ \hline \end{array}$$

Then say, If 500 pair cost l. 276-5, what 1 pair?

Answ. 11s. 6d. $\frac{1}{11}$.

Example 5. An halfpenny in the shilling, what is that per Cent.

$$\begin{array}{r} l. 100 \\ 20 \\ \hline \end{array}$$

Or thus :

$$\begin{array}{r} 4)100 \\ \hline \end{array}$$

$$\begin{array}{r} \frac{1}{2})2000 \text{ shillings} \\ \hline \end{array}$$

$$\begin{array}{r} 6)25 \\ \hline \end{array}$$

$$\begin{array}{r} 12)1000 \\ \hline \end{array}$$

$$\begin{array}{r} 1.4-3-4 \\ \hline \end{array}$$

$$\begin{array}{r} 8)3-4 \\ \hline \end{array}$$

Answ. 4-3-4 per Cent.

A penny in the shilling is as much again; 2d four times as much; 3d six times as much, &c. So you may multiply it either by 2, 4, or 6, to know how much you gain per Cent. at those rates in a shilling, &c. Or consider what part of a shilling your profit is, $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{6}$, or $\frac{1}{8}$, &c. and take that part of 100l. and the quotient will be what such profit in a shilling makes per Cent.

Example 6. As suppose 2d in the shilling be your profit, two-pence we know is the $\frac{1}{4}$ of a shilling, wherefore I take the 4th part of a 100l. thus:

$$\begin{array}{r} 6)100l. \\ \hline \end{array}$$

6)100l.

Answ. 16-13-4 per Cent.

In the last example, $\frac{1}{4}d$ in the shilling was l. 4-3-4 per Cent. where if you multiply by four, the halfpence in 2d. you'll find the same answer l. 16-13-4 proof. And so the contrary.

Again, admit I gain $3d\frac{1}{2}$, or $5d$. in the shilling, what is that per Cent.?

Here in regard that $3d\frac{1}{2}$ is $\frac{7}{4}$, and $5d$ $\frac{5}{2}$ of a shilling I multiply 100 by the numerator, and divide by the denominator, according to the 4th table at the beginning of the rule of *Practice*, thus:

$3d\frac{1}{2}$ in the 1s. 7 halfpence 5 pence in the 1s. i. e. $\frac{5}{2}$.

$$\begin{array}{r} 100 \\ 4)700 \\ \hline \end{array}$$

$$\begin{array}{r} 6)175 \\ \hline \end{array}$$

$$\begin{array}{r} 100 \\ 12)500 \\ \hline \end{array}$$

$$\begin{array}{r} l. 41\frac{6}{12} \text{ or } \frac{3}{2} \text{ i. e. } 13s. 4d. \\ \hline \end{array}$$

Answ. l. 19 $\frac{1}{8}$, or 3s. 4d.

As whatever part of a shilling is your profit, the same per Cent. will be your profit also: so on the contrary whatever part of 100l. is your profit, the same part of a shilling will be your profit likewise. As suppose your gain be 25 per Cent. which is the 4th part of 100l. so your gain in a shilling will be 3d. at the rate of 25 per Cent. for as 25 is the 4th part of 100l. so is 3d. of 12d.

Example 7. If I purpose to get in any goods 20l. per Cent. profit, what is that in a shilling? 20l. is the 5th part of 100l. wherefore take the 5th part of a shilling for the profit; thus:

$$\begin{array}{r} 12d. \\ 5)12d. \\ \hline \end{array}$$

$$2\frac{4}{5}$$

Example

Chap. XVIII. PROFIT and LOSS. 275

Example 8. Suppose I have goods to the value of l. 415-12-6, that come to a bad market, and know that they impair by lying, I therefore am obliged to sell them at 12 *per Cent.* loss, what come they to?

Here the loss must be subtracted from 100l. and the remainder is the middle number.

From 100	If 100—88l. what l. 415	12	6
take 12	Answ. 365	15	0
—			
88	Lost in all, l. 49	17	6
—			

Or thus: See what l. 415-12-6, comes to at 12 *per Cent.* and subtract that from the cost of the goods.

$$\begin{array}{r} \text{l. 415-12-6} \\ \underline{12} \end{array}$$

$$\begin{array}{r} \text{l. 49|87-10} \\ \underline{20} \end{array}$$

$$\begin{array}{r} \text{s. 17|50} \\ \underline{12} \end{array}$$

$$\begin{array}{r} \text{d. 6|00} \end{array}$$

$$\begin{array}{r} \text{From l. 415} \quad 12 \quad 6 \\ \text{take} \quad 49 \quad 17 \quad 6 \end{array}$$

$$\text{Answer l. 365} \quad 15 \quad 0$$

If deal boards be bought at 18*d.* *per piece*, and sold again at 21*d.* what is that *per Cent.* profit?

Answer l. 16 13 4, thus:

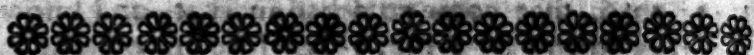
If 18*d.*—gain—3*d.*—what—100l.

If I buy cinnamon for 6*s.* 7*d.* *per lb.* and sell it again for 5*s.* 9*d.* what is lost *per Ct*? Ans. l. 12-13-17.

If 6*s.* 7*d.*—lose—10*d.*—what—100l.

There are two or three other rules, which might be introduced, such as *Allegation Medial* and *Alternate*, and the *Rule of False*; but they being more for amusement than real use, I shall omit them; and in the next place, say something of *Fractions*.

G H A P.



C H A P. XIX.

Of FRACTIONS, Vulgar and Decimal.

N U M E R A T I O N.

I. **A** Fraction is part of a whole number, and arises from *Division*, (as was said before) and hath these two parts, viz. *Numerator* and *Denominator*, which have a short line between them, and set thus:

Remainder 5 Numerator.

Divisor 8 Denominator.

The Numerator expresses the number of parts, and the Denominator giveth to those parts their names. As suppose 277l. be divided among 8 men, the quotient will be 34l. the share to each man; and there will be a remainder of 5, which must be set over the *Divisor* 8, thus $\frac{5}{8}$, and signifies, that if a l. or 20s. were divided into 8 parts, each man must have 5 of those 8 parts (or $\frac{1}{2}$ crowns) more to his share, as was before hinted.

II. A vulgar fraction is either *Simple* or *Compound*.

III. A simple vulgar fraction is that which hath only one numerator, and one denominator, and is either proper or improper.

IV. A proper fraction hath always its denominator greater than its numerator, as $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, &c.

V. An improper fraction hath its numerator always greater than its denominator, as $\frac{3}{2}$, $\frac{5}{4}$, $\frac{7}{3}$, &c.

VI. Compound fractions consist of divers numerators and denominators, and are known by this particle [*of*] being between them; and are therefore some-

Sometimes called fractions of fractions, as $\frac{2}{3}$ of $\frac{1}{5}$ of $\frac{7}{8}$, that is, two thirds of five sixths of seven eighths.

VII. Fractions are of two kinds, *Vulgar* and *Decimal*.

What *Vulgar* fractions are, hath been declared already. A *decimal* fraction is an artificial way of expressing vulgar fractions, by setting down the numerators only, the denominators being understood, but not expressed, and is always an unit, with as many cyphers annexed as there are places in the numerator; and therefore must be either 10, 100, 1000, 10000, 100000, &c.

VIII. A decimal fraction is distinguished from a whole number by a comma, or point prefixed thus, 5 and signifies 5 tenths of an integer: so the following fractions are exhibited vulgarly and decimally, viz.

7 Tenths,	}	$\frac{7}{10}$	,7
35 Hundreds,		$\frac{35}{100}$	,35
327 Thousands,		$\frac{327}{1000}$	,327
64 Ten Thousands,		$\frac{64}{10000}$	,0064
108 Hundred Thouf.		$\frac{108}{100000}$	,00108

In decimals $\frac{1}{4}$ of any thing is ,25; $\frac{1}{5}$ of *ditto*, is, 5, is ,75.

IX. As whole numbers increase by a tenfold proportion from the unit's place to the left hand; so Decimals decrease by the same proportion, from unity to the right hand, as may be seen by the following table.

B b

Integers

Integers						Decimals.						
Millions	C. of Thousands	X's of Thousands	Thousands	Hundreds	Tens		Tenth Parts	Hundredths	Thousandths	X. Thousandths	C. Thousandths	Millions of Parts
7	6	5	4	3	2	1	2	3	4	5	6	7
						Units.						
Seventh Place	Sixth Place	Fifth Place	Fourth Place	Third Place	Second Place		Primes	Seconds	Thirds	Fourths	Fifths	Sixths

Integers, or whole increasing numbers

Decimals, or fractional decreasing numbers.

Here the figure 2 in the Integers signifies 2 tens or twice 10 units; but the figure 2 in the Decimals signifies but 2, or 2 tenths of unity, or one.

X. The order of places in whole numbers is from the right hand to the left; but in Decimals it is from the left hand to the right. So in this Decimal, .456, the figure 4 stands in the first place, and is 4 Primes, or 4 tenths of an Integer; and 5, the second figure, is 5 Seconds, or five hundred parts of an integer, &c.

XI. Cyphers before Integers, and after Decimals, are of no value, but after Integers and before Decimals they have their value: For, in integers they increase and in decimals they decrease the value of the figure join'd with them. For 4, and 04, and 004, in whole numbers, is still but four; but in Decimals, 4, by having a point prefix'd thus, .4 is decreased from 4 Integers to $\frac{4}{10}$ of an Integer, and .04 to 4 hundredth parts of an Integer, &c. Again, in whole numbers, 30 is thirty, and 300 is three hundred; but in Decimals, .30 or .300 is still but $\frac{3}{10}$ of an Integer.

Re-

Reduction of Fractions, is to bring a fraction into a common, or into the least denomination; thereby preparing fractions to be added, subtracted, multiplied, or divided.

XII. To reduce fractions that have unequal denominators, to fractions of one common denominator.

The Rule.

Multiply each numerator into all the denominators, (except its own) and take the respective products for new numerators, 2^{dly}, Multiply all the denominators continually; so shall that product be a new denominator, common to all the numerators found before.

Example.

Reduce $\frac{2}{3}$, $\frac{3}{7}$, and $\frac{8}{9}$ of a pound, to a common denominator.

The first 2 the 2^d, 3 the 3^d, 8 Denominator.

7	5	7	5	
—	—	—	—	
14	15	56	7	
9	9	5	35	
—	—	—	—	
9	9	5	35	
—	—	—	—	
126	135	280	315	com. de-
315	315	315	315	nominator

Here I first multiply 2 by 7, and the product is 14, which I multiply by 9, and the result is 126, for the first numerator. Again, I multiply 3 by 5, and the product is 15, which multiplied by 9, makes 135, for the second numerator: Then I multiply 8 by 7, and the product is 56, which multiplied by 5 produces 280, for the last numerator. Last of all, I multiply, 5, 7, and 9, the several denominators together, and their product is 315, for the common denominator to all the fractions. See the work above.

Reduce $\frac{1}{2}$, and $\frac{5}{8}$ — $\frac{5}{16}$ — $\frac{10}{16}$ }
 Reduce $\frac{1}{2}$, and $\frac{3}{4}$ — $\frac{3}{8}$ — $\frac{3}{8}$ } Facit.
 Reduce $\frac{3}{7}$, and $\frac{1}{9}$ — $\frac{3}{63}$ — $\frac{7}{63}$ }

To prove your work, divide the new numerator by the numerator of the fraction; and also divide the common denominator by the denominator of the fraction, and if both quotients are alike, the work is right.

XIII. Abbreviation, or how to bring a fraction into its lowest denomination.

The Rule.

Divide both numerator and denominator by such a number as will leave no remainder in either of them. When the numerator and denominator are both even numbers, they may be reduced by halving, or dividing them by 2.

Example. Reduce $\frac{12}{28}$ into its lowest terms, or denomination.

$$2 \left\{ \frac{12}{28} \middle| \frac{6}{14} \middle| \frac{3}{7} \text{ Answer } \frac{3}{7} \right.$$

Here I say, the $\frac{1}{2}$ of 12 is 6, and the $\frac{1}{2}$ of 28 is 14; and then again the $\frac{1}{2}$ of 6 is 3, and the $\frac{1}{2}$ of 14 is 7: So is the fraction $\frac{12}{28}$ reduced to $\frac{3}{7}$ its lowest terms; and $\frac{3}{7}$ of any thing is equal in value to $\frac{12}{28}$. Or if you had divided the said fraction by 4, it had been reduced at once; for the 4's in 12, 3 times, and the 4's in 28, 7 times, or $\frac{3}{7}$, as before.

When you can no longer halve the fraction, then divide it either by 3, 4, 5, 6, 7, &c. if any of them so divide as to leave no remainder. And after you have divided by a greater, you may after divide by a lesser number, to reduce the fraction lower still.

Example

Example. Reduce $\frac{1}{11}$ into its lowest denomination.

$$\frac{1}{11} \left\{ \begin{array}{c} \text{by} \\ 84 \mid 2 \mid 42 \mid 7 \mid 21 \mid 3 \mid 3 \mid 1 \\ \hline 168 \mid 2 \mid 84 \mid 7 \mid 42 \mid 3 \mid 6 \mid 2 \end{array} \right\} \text{Ans. } \frac{1}{11}.$$

Here I first take the $\frac{1}{11}$, or divide it by 2, and then by 7, and then by 3, and then by 3 again, which brings the fraction into $\frac{1}{11}$, its lowest terms.

(3.) If the fraction, *viz.* numerator and denominator, and each with a figure of 5, or a cypher, or the one with a 5, and the other with a cypher, divide each of them by 5, and the quotient will be a new numerator and denominator.

Example. Reduce $\frac{55}{80}$, and $\frac{11}{16}$, to their lowest terms.

$$5 \left\{ \frac{55}{80} \mid \frac{11}{16} \right\} \text{Answer } \frac{11}{16}.$$

$$5 \left\{ \frac{75}{95} \mid \frac{15}{19} \right\} \text{Answer } \frac{15}{19}.$$

(4.) There is a way of reducing a fraction into its lowest name by a common measure, which is thus:

Divide the denominator by the numerator, and if any thing yet remains, divide the foregoing or last divisor by it; and so you must do till nothing remains, and then the last divisor is the common measure required, which will divide both the numerator and denominator, without leaving any remainder; and so reduce the fraction into its lowest terms at once. But if your last divisor be 1, the fraction is in its lowest name already.

B b 3

Example

Example. Reduce $\frac{144}{128}$ into its lowest terms by a common measure.

$$\begin{array}{r} 128 \overline{)144}(1 \\ \underline{128} \end{array}$$

$$\begin{array}{r} 16 \overline{)128}(8 \\ \underline{128} \\ (0) \end{array}$$

$$\begin{array}{r} 16 \overline{)128}(8 \\ \underline{128} \end{array}$$

$$\begin{array}{r} (0) \\ 16 \overline{)144}(9 \\ \underline{144} \\ (0) \end{array}$$

Here I first divide 144 by 128, and there remains 16; by which I divide the last divisor 128, and there remains (0), wherefore 16, the last divisor, is the common measure sought for, and divides both numerator and denominator, without leaving any remainder, (as may be seen in the work above) and reduces the fraction into $\frac{9}{8}$, its lowest terms.

But I prefer the other way, in common business, before this latter; for the time spent in finding the common measure, is longer than that spent in reducing the fraction the other way.

It is very expeditious in many cases to work fractionally, *viz.* to multiply by the numerator, and divide by the denominator of a fraction into its lowest terms.

Example. What comes a hundred weight to at 6d. $\frac{1}{2}$ per pound? Consider that $\frac{1}{2}$ in its lowest terms, is $\frac{1}{2}$, wherefore multiply 6d. $\frac{1}{2}$ by 2, and divide it by 1, thus:

$$\begin{array}{r} 6d. \frac{1}{2} \\ \underline{7} \\ 3 \overline{)45} \frac{1}{2} \text{ Rem. } \frac{3}{2}, \text{ or } 8d. \\ \underline{5)15} \end{array}$$

Ans. *i. e.* 308 per Cent.

Or

Or if you double the price of a pound, and multiply by 7 and by 8, as follows, you have the answer.

$$\begin{array}{r}
 6d. \frac{1}{2} \\
 \hline
 s. 1-1 \\
 7 \\
 \hline
 7-7 \\
 8 \\
 \hline
 \text{Answ. } 3-0-8
 \end{array}$$

Or contrariwise, you have the price of a pound thus :

$$7)60s. 8d.$$

$$\begin{array}{r}
 8) \quad 8 \quad 8 \\
 2) \quad 1 \quad 1 \\
 \hline
 \end{array}$$

6d. $\frac{1}{2}$ Answer.

Any goods sold by the long hundred, in tale or 120 to the hundred, as linen, fish, deals, &c. being $\frac{1}{12}\%$ multiply the price of one by 6, and divide that product by 12, thus :

Example. Fish at $3d. \frac{1}{2}$ a piece.

$$\begin{array}{r}
 6 \\
 \hline
 12)21 \\
 \hline
 l. 1 \text{ } 7\frac{1}{2} \text{ or } 15s.
 \end{array}$$

When things are sold by the 1000, as bricks, tiles, hoops, &c. standing thus, $\frac{1}{1000}\%$, then multiply the price of one by 50, and divide by 12, it gives the price of 1000.

Ex-

Example. Oranges at 2d. a piece.

$$\begin{array}{r} 50 \\ \hline 12 \overline{)100} \end{array}$$

Answ. *l.* $8\frac{4}{3}$ or 6s. 8d. per thousand

$$\begin{array}{r} 12 \\ \hline 50 \overline{)100} \quad 0 \quad 0 \end{array} \left. \vphantom{\begin{array}{r} 12 \\ \hline 50 \overline{)100} \quad 0 \quad 0 \end{array}} \right\} \text{contrary}$$

2d a piece.

Or any thing sold by the 100, may be done by multiplying the quantity by the price, always cutting off 3 figures, or cyphers, towards the right hand.

Example. Bought 4796 plain tiles, at 7s. 6d. per M.

$$\begin{array}{r} 17 \\ \hline 6d. \text{ is } \frac{3}{4} \text{ of } 1s. \quad 81532 \\ 2398 \\ \hline 83 \overline{)930} \\ 12 \end{array}$$

$$\begin{array}{r} 4 \overline{)311160} \end{array}$$

$$\text{Answ. } \underline{\underline{\textit{l. } 4-3-11 \frac{160}{1000}}}$$

This is an easy and plain method.

Again, sold 45874 grey stock bricks, at 18s. per M.

$$\begin{array}{r} 18 \\ \hline 82 \overline{)5732} \\ 12 \\ \hline \textit{l. } 41-5-8 \overline{)784} \\ 4 \\ \hline 3,136 \end{array}$$

I multiply by 18, and it produces 825s. and 732 cut off for 1000, and that multiplied by 12, gives 8d. &c.

$$\text{Answ. } \underline{\underline{\textit{l. } 41-5-8 \frac{130}{1000}}}$$

A fraction is seldom abbreviated in decimals.

XIV. Valuation. The value of a fraction is found by multiplying the integer by the numerator of the fraction, and dividing that product by the denominator, and multiplying by the numerator.

Example. What is the $\frac{3}{4}$ of a *l. Sterling*?

Contra 3)20

$$\begin{array}{r} \text{6-8} \\ 2 \\ \hline \text{s. 13 4 Answer.} \end{array}$$

20s. the integer
2 numerator

$$\begin{array}{r} 3)40 \\ \hline \text{s. 13 4 Answer.} \end{array}$$

What is the $\frac{5}{7}$ of a pound?

$$\begin{array}{r} 20s. \\ 4 \\ \hline 5)80 \\ \hline 16 \text{ Answer.} \end{array}$$

What is $\frac{1}{3}$ of 20s.

3 its lowest terms.

$$\begin{array}{r} 7)60 \\ \hline \text{s. 8 } \frac{4}{7} \text{ Answer.} \end{array}$$

What is $\frac{1}{7}$ of a hundred weight?

Contra 7)112

112lb. the integer.

$$\begin{array}{r} 16 \\ 3 \\ \hline 48lb. \text{ Answer.} \end{array}$$

$$\begin{array}{r} 3 \\ 7)336 \\ \hline 48lb. \text{ Answer.} \end{array}$$

What

What is	$\frac{6}{7}$ of a <i>l.</i> ?	Answ. 17 <i>sd.</i> $\frac{1}{2}$ $\frac{6}{7}$
	$\frac{7}{8}$ of a Shilling?	Answ. 10d. $\frac{1}{2}$
	$\frac{6}{7}$ of a <i>l.</i> 100 <i>Sterling</i> ?	Answ. 75 $\frac{1}{2}$
	$\frac{7}{8}$ of a Tun of Wine?	Answ. 176 $\frac{1}{2}$ Gal.
	$\frac{7}{8}$ of a C. Weight?	Answ. 71 $\frac{1}{2}$ $\frac{1}{2}$
	$\frac{7}{8}$ of a Gallon?	Answ. 70 $\frac{1}{2}$ Pints.
	$\frac{7}{8}$ of a Tun Weight?	Answ. 15 C.
	$\frac{7}{8}$ of a Foot?	Answ. 8 Inches.
	$\frac{7}{8}$ of a <i>lb.</i> Weight?	Answ. 12 Ou.

*Mixed numbers.*What is $\frac{4}{5}$ of 12s. 6d.?

Contra 6)12s. 6d.

4	2 1
6)50 0	4
8 4	8 4

If a yard of cloth be worth 18s. 10d. what $\frac{3}{4}$?

3
4)26 6
6 7 $\frac{1}{2}$ Answ.

If a ship be worth *l.* 946 12 6, what $\frac{4}{5}$ parts?

4
8)3786 10 0
4)473 06 3
<i>l.</i> 118 06 6 $\frac{1}{2}$

XV. If you would know what part of a pound any number of shillings and pence is, or what part of a tun any quantity C. qrs. and *lb.* is, bring them into the

the lowest name mentioned; and also bring the integer into the same name, and set it for a denominator; and then bring the fraction into its lowest terms.

Example. What part of a pound is 12s. 6d.

20s. the integer	12	
12		
240		
	Numerator, 15 0 5	}
	Denominator, 24 0 8	
		Answer.

When there are cyphers in a vulgar fraction at the end, they may be cut off, and you work as if there were none; as in the foregoing example.

What part of C. weight is 71 lb. $\frac{1}{4}$?

11	112 lb. the integ.
784	11
1232	1232
1232	1232

Ans. $\frac{784}{1232}$, or $\frac{7}{11}$, in its lowest terms,

XVI. *To reduce vulgar fractions into decimals.* Reduction of decimals is either from common fractions, or into some known denomination. Therefore to reduce any vulgar fraction into a decimal, to the numerator of the fraction, annex 1, 2, 3, 4, 5, or more cyphers, at pleasure, and then divide by the denominator.

Example. Reduce $\frac{3}{4}$ of a l. into a decimal fraction,

4)300
75 Facit, or 15s.

Here to the numerator 3, I annex two cyphers, and divide by the denominator, and it quotes .75; which is equal in value to $\frac{3}{4}$ of any thing.

If I had annexed 3 cyphers to the numerator, the quotient would then have been .750, which is still but .75; for cyphers on the right hand do not increase or diminish a decimal, as was said before. Again,

Reduce

Reduce $\frac{2}{3}$ of a *l.* into a decimal.

$$\begin{array}{r} 3 \overline{)2000} \end{array}$$

,666 Facit, or 13s. 4d.

Reduce 6s. 8d. into a decimal,

$$\begin{array}{r} 12 \overline{) } \end{array}$$

$$\begin{array}{r} 8 \overline{)0|2} \end{array}$$

$$\begin{array}{r} 24 \overline{)0|6} \end{array}$$

$$\begin{array}{r} 6 \overline{)2000} \end{array}$$

,333 facit, or 6s. 8d.

XVII. Valuation of decimals. In money you must account for every prime, or unit, in the first place, 2 shillings; and for every 5 in the second place, 1 shilling; and what is above 5, account so many tens; and the figure in the third place, so many units; which tens and units are farthings; but if they exceed, $\frac{2}{4}$ there must be one farthing abated.

Example. What is the value of ,75*l.* the first of the foregoing examples? Answ. 15s. For the 7 in the first place, I reckon 14s. and for 5 in the second I account 1s. which put together, make 15s. the value of the decimal fraction.

Again. Another *Example* is, ,333: For the first 3 I reckon 6s. and for the other two I account 33 farthings, and abating 1, (because above 25) there rest 32, or 8d.

What is the value of ,9749? The first figure 9, being doubled, makes 18s. and the figure (7) in the second being above 5, I reckon 1s. which put to the 18, makes 19s. and the excess of 7 above 5 being 2, or 2 tens, makes the next figure 4 to be 24, which is 24 farthings, or six pence. So the decimal fraction, ,9749 is in value 19s. 6d. *A decisive Rule.* As often above 13 makes less by 1, or above 39 makes less by 2.

When you would know the value of a decimal in weight, measure, &c. (as the value of decimals of money may be also found) multiply the decimal by the parts of the next inferior denomination, which make an

an integer in the same denomination with the given decimal; and cut off so many figures towards the left hand, as there are places in the decimal, and the figures on the other side of the stroke towards the left hand, are the value of the decimal, in the next inferior denomination. And if there be any thing remaining, multiply it by the parts of the next lower denomination, &c. And so the fraction may be reduced as low as you please.

Example. What is the value of this decimal of a C. weight, viz. .875 Answ. $\frac{7}{8}$ 14 lb. 4 qrs. 1 C.

$$\begin{array}{r} 3 \overline{) 500} \\ 28 \text{ lb. 1 qr.} \end{array}$$

$$\begin{array}{r} 4000 \\ 1000 \end{array}$$

$$14 \overline{) 000}$$

Here three places are cut off towards the left hand, because there are so many in the decimal. And thus may the value of any decimal be found, whether of money, weight, measure, time, &c.

XIX. To reduce compound fractions into simple ones of the same value.

Rule. Multiply all the numerators continually for a numerator, and all the denominators for a denominator.

Ex. Reduce $\frac{3}{5}$ of $\frac{4}{6}$ of $\frac{7}{8}$ of a *l.* into a simple fraction.

$$\begin{array}{r} 3 \\ 5 \\ \hline 15 \\ 7 \\ \hline \end{array} \qquad \begin{array}{r} 4 \\ 6 \\ \hline 24 \\ 8 \\ \hline \end{array}$$

Numerator 105 192 Denominator,

Denomin. 192 facit.

Reduce $\frac{7}{8}$ of $\frac{1}{2}$ of $\frac{1}{4}$ of a tun $\frac{1}{16}$ 7.

C c

XX.

XX. To reduce whole or mixed numbers into improper fractions. *Rule.*

(1.) If a whole number is to be reduced into an improper fraction, set the propos'd whole number for the numerator, and an unit, or 1, the denominator. Thus 8 integers may be reduced to $\frac{8}{1}$; or else you may assign a denominator to the integer, and multiply it by the assigned denominator, and the product will be the numerator to the said denominator.

Ex. Admit 9 integers are to be reduced into an improper fraction whose denominator shall be 5: Here I multiply 9 by 5, the propos'd denominator, and the product is 45, for a numerator to the said denominator 5; so is the improper fraction $\frac{45}{5}$ equal to 9 integers.

Reduce 24 into an improper fraction, whose denominator shall be 8.

$$\begin{array}{r} 24 \\ 8 \\ \hline 192 \end{array} \left. \vphantom{\begin{array}{r} 24 \\ 8 \\ \hline 192 \end{array}} \right\} \text{Facit.}$$

(2.) If a mixt number is to be reduced into an improper fraction. *Rule.*

Multiply the whole number by the denominator of the fraction, and take in the numerator.

Ex. Reduce $12\frac{3}{4}$ into an improper fraction.

$$\begin{array}{r} 4 \\ \hline 51 \end{array} \left. \vphantom{\begin{array}{r} 4 \\ \hline 51 \end{array}} \right\} \text{Facit. equal to } 12\frac{3}{4}.$$

Again, Reduce $l. 14\frac{7}{8}$, or $l. 14-17-6$ into an improper fraction.

$$\begin{array}{r} 8 \\ \hline 119 \end{array} \left. \vphantom{\begin{array}{r} 8 \\ \hline 119 \end{array}} \right\} \text{Facit.}$$

XXI. To reduce improper fractions into whole or mixt numbers. *Rule.*

Divide the numerator by the denominator, and if it be a mixt number, what was taken in will remain.

Example. Reduce $1\frac{19}{8}$ (the foregoing sum) into its equivalent mixt number.

$$\begin{array}{r} 8 \overline{) 119} \end{array}$$

$14\frac{7}{8}$ Ans. Or $14-17-6$.

Here the answer is 14 integers, and $\frac{7}{8}$ of an integer.

Reduce $5\frac{1}{4}$ yards into a mixt number.

$$\begin{array}{r} 4 \overline{) 51} \end{array}$$

$12\frac{3}{4}$ yards Answer.

Reduce $4\frac{1}{5}$ into its equivalent whole number.

$$\begin{array}{r} 5 \overline{) 45} \end{array}$$

9 Ans. 9 Integers.

XXII. To reduce fractions from one denominator to another.

(1.) This is either a smaller fraction to be brought into the denomination of a greater. Or,

(2.) A greater into that of a smaller.

Ex. Reduce $3d. \frac{1}{2}$ into the fraction of a *l. Sterl.* Make it a compound fraction thus. Reduce the mixt number into an improper fraction, thus, $3d. \frac{1}{2}$, then say what is $\frac{1}{2}$ of $1\frac{1}{2}$ of $\frac{1}{20}$ of a *l.*

Ans. $\frac{7}{480}$. Or you may say, what is $\frac{1}{2}$ of $\frac{1}{240}$?

Ans. $\frac{7}{480}$.

Here it being reduced from a compound fraction to a simple one, according to the 19th rule of this chapter, it produces $\frac{7}{480}$, the proper fraction of a *l.* belonging to $3d. \frac{1}{2}$.

Reduce $\frac{1}{4}$ of a penny to the proper fraction of a *l*.
 Say $\frac{1}{4}$ of $\frac{1}{12}$ $\frac{1}{10}$ or $\frac{1}{4}$ of $\frac{1}{120}$. Answ. $\frac{1}{480}$.

By the same method may be reduced either weight or measure, &c.

When the fraction is to be brought from a greater to a lesser name, then multiply the numerator by the parts in the several denominations, betwixt that and it, that you would reduce it to.

As suppose the reverse of the last question was asked, viz.

What part of a penny is the $\frac{1}{480}$ of a *l*.

$$\begin{array}{r} 3 \\ 20 \\ \hline \end{array}$$

$$\begin{array}{r} 60 \\ 12 \\ \hline \end{array}$$

$$\begin{array}{r} 720 \\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 2880 \\ 3 \\ \hline \end{array} \left. \vphantom{\begin{array}{r} 2880 \\ 3 \\ \hline \end{array}} \right\} \text{Answer.}$$

$$\begin{array}{r} 3 \overline{)2880} \\ \underline{960} \end{array} \text{Proof.}$$

Again, Reduce $\frac{1}{4}$ of a *l*. to the fraction of a penny.

$$\begin{array}{r} 3 \\ 20 \\ \hline \end{array}$$

$$\begin{array}{r} 60 \\ 12 \\ \hline \end{array}$$

$$\begin{array}{r} 720 \\ 4 \\ \hline \end{array}$$

$$\begin{array}{r} 2880 \\ 3 \\ \hline \end{array} \left. \vphantom{\begin{array}{r} 2880 \\ 3 \\ \hline \end{array}} \right\} \text{Facit.}$$

Addition of Fractions.

If the fractions to be added have a common denominator, then add all the numerators together for a numerator, and place it over the common denominator.

Example

Exam. What is the sum of $\frac{2}{3}$, $\frac{3}{4}$, and $\frac{4}{5}$, of a *l.*?

$$\begin{array}{r} 2 \\ 3 \\ 4 \\ \hline 9 \\ \hline 5 \end{array}$$

This being an improper fraction, I reduce to it to a mixt number, and it makes $1\frac{4}{5}$, or *l.* 1-16.

Or thus: Decimally Demonstration.

$\frac{2}{3}$	,4	$\frac{2}{3}$	,40	$\left. \begin{array}{l} \frac{2}{3} \\ \frac{3}{4} \\ \frac{4}{5} \end{array} \right\}$	is	0	8	0
$\frac{3}{4}$	,6	$\frac{3}{4}$	,60			0	12	0
$\frac{4}{5}$	,8	$\frac{4}{5}$	,80			0	16	0

	<i>l.</i> 1,8		1,80, or <i>l.</i> 1-16.		<i>l.</i> 1 16 0 <i>Proof.</i>
-------	---------------	-------	--------------------------	-------	--------------------------------

Here the vulgar fraction being reduced to decimals, according to the 16th rule of this chapter, I cast up the respective decimals, as I do whole numbers, and the answer is 1 integer, and ,8 of an integer; that is *l.* 1-16 the 8 primes being accounted 16s. according to the rule of valuation of decimals, given in the 17th rule of this chapter.

In *Addition of Decimals*, we observe the same method as in whole numbers, only in setting down, regard must be had that the fractional parts stand one under the other, *viz.* primes (or tenths) under primes; seconds under seconds; thirds under thirds, &c. And if mixt numbers are to be added, then the fractions to stand as before directed, and the whole numbers to stand as in whole numbers; that is, units under units; tens under tens, &c. without any regard to the fractions annexed.

Examples.

Fractions.		Mixt Numbers.
,45	,4	124,97
,5	,574	7,065
,095	,0067	27,5
,225	,56	65,007
1,270	1,5407	224,542

Note, That so many fractional places as are found in the greatest among those numbers that are added, so many places must be pointed off from the total, towards the right hand, for decimal parts, and the other figures towards the left hand are whole numbers, as in the foregoing examples may be observed.

Again, Add 4 foot 3 inches, 6 foot 9 inches, and 8 foot 9 inches together.

Feet Pts.

4 , 25

6 , 75

8 , 50

19 , 50 Answer 19 Foot $\frac{1}{2}$

More Examples.

Integer Parts.

41 , 426

16 , 04

36 , 274

22 , 8

116 , 540

Decimal Parts of a l.

,333

,25

,75

,033

,3

} or

s. d.

6 8

5 0

15 0

0 0 $\frac{1}{4}$

6 0

1,636 l. 1 12 8 $\frac{1}{4}$

S U B.

SUBTRACTION.

I. As in *Addition*, if the fractions have unequal denominators, they must be reduced to a common denominator before *Subtraction* can be made. Then subtract one numerator from the other, and place the difference over the common denominator.

From $\frac{7}{8}$ of a *l.* take $\frac{2}{3}$

Decimally.

,875

,666

—

,209 Answ. 4s. 2d.

7 2 8

3 8 3

—

21 16 24

16

—

5

—

24

Anf. 4s. 2d.

From $\frac{7}{8}$ take $\frac{1}{4}$. Answer $\frac{4}{8}$ or $\frac{1}{2}$

Decimally.

,875

,375

—

Anfw. ,500

From $\frac{1}{8}$ *l.* take $\frac{1}{4}$

16

—

8

—

11

8

—

3

—

16

Anf. 3s. 9d.

Subtraction of Decimals is the same as in whole numbers, observing to keep the same order of placing the numbers as directed in *Addition of Decimals*.

II. To subtract a fraction from a whole number.

Rule. Subtract the numerator of the fraction from the denominator, and the remainder place over the given denominator, for a numerator; and take a unit from

from the whole number for what you borrowed, and the remainder place before the fraction found; which mixt number shall be the difference sought.

Example. Subtract $\frac{6}{8}$ l. from 25, Facit 24 $\frac{2}{8}$.

Here 6 from 8 and there rests 2, which I put over the denominator 8, thus $\frac{2}{8}$; then 1 from 25, there rests 24, which I place before the fraction $\frac{2}{8}$, thus: 24 $\frac{2}{8}$; which is the difference sought.

From 12 ells take $\frac{1}{2}$, Facit 11 $\frac{1}{2}$.

Decimally. From .6875 take .5 of a l.

.5000

.1875 Answ. or 3s. 9d.

Here the vacancy is supplied with cyphers, or they might have been omitted, and only supposed to have been there; and if at any time there should be a vacancy in the upper number, it may be supplied with cyphers; or, as abovesaid, accounted there.

Example. Subtract this decimal of a l. viz. 75 from this whole number, 25l.

25.00

.75

24.25 or l. 24-5.

Here the defect (tho' not of places, yet of number) is supplied by annexing cyphers to the whole number; for otherwise you could not subtract .75 from 25.

III. To subtract a mixt number from a whole number.

Rule. From the denominator of the fraction subtract the numerator, and set the remainder over the denominator, and then pay 1 to the whole number, and subtract it from the integer, and the remainder is the true difference sought.

Example

Example. From 12s. take $5\frac{1}{4}$.

$5\frac{1}{4}$

Decimally.

12s.

Facts $6\frac{1}{2}$ or 6s. $7d.\frac{1}{2}$ 5.375

6.625 or 6s. $7d.\frac{1}{2}$

Again. From 24 ells take 19 ells $\frac{1}{2}$

Decimally.

$19\frac{1}{2}$

24

19-6

$4\frac{1}{2}$

4-4 Answ.

From 16C. take C. $13\frac{7}{8}$

$13\frac{7}{8}$

Decimally

16.

13.4375

$2\frac{1}{8}$ Answ.

2.5625

IV. To subtract a mixt number from a mixt number.

Rule. (1.) Take the lesser numerator from the greater.

Example. From $37\frac{1}{2}$ take $23\frac{1}{2}$.

Decimally.

$23\frac{1}{2}$

37 . 875

23 . 625

$14\frac{1}{2}$ Answ.

14 . 250

(2.) When a greater fraction is to be taken from a lesser, then take the numerator of the greater fraction from its denominator, and put the remainder to the numerator of the lesser, which is borrowing an integer, &c.

Example. Take C. $24\frac{1}{2}$ from $35\frac{7}{8}$ C. $35\frac{7}{8}$

$24\frac{1}{2}$

Facts, $10\frac{1}{8}$

From

From *Gal.* $78\frac{1}{2}$ take *Gal.* $29\frac{1}{2}$. Reduce to a common denominator.

$$\begin{array}{r} \text{The fractions } \frac{1}{2} \text{ and } \frac{1}{2}, \text{ then from } 78\frac{1}{2} \\ \text{take } 29\frac{1}{2} \\ \hline \text{Facit, } 49\frac{1}{2} \\ \hline \end{array}$$

MULTIPLICATION.

Rule I. First multiply the numerators together for a new numerator; and secondly, multiply the denominators together for a new denominator.

Example. Multiply *l.* $\frac{7}{4}$ by $\frac{1}{2}$ of a *l.*

$$\begin{array}{r} \text{Here 7 times 3 is 21, the numerator, } 21 \\ \text{And 8 times 4 is 32, the denominator, } 32 \end{array} \left. \begin{array}{l} \text{Facit,} \\ \text{or} \\ 13 - 1\frac{1}{2} \end{array} \right\}$$

Multiplication in whole numbers increases the product, but in fractions it decreases, that is, makes it less than either of the two numbers alone.

The reason is, because 1 multiplied by 1 is but 1; therefore that which is less than 1, being multiplied by that which is less than 1, must needs be lessened by *Multiplication*.

In *Multiplication of Decimals*, we proceed as in whole numbers, only when you have done your multiplication, you must point off from the product, as many figures, or cyphers towards the right hand, as there are fractional places in both multiplicand and multiplier; and what figures remain toward the left hand, beside what are cut off, are integers: But if there are not so many places, such defect must be supplied by cyphers towards the left hand.

Example. Multiply the foregoing sum, viz. $\frac{7}{4}$ by $\frac{1}{2}$ decimally.

Here

$$\begin{array}{r} \frac{7}{8}, 875 \\ \frac{3}{4}, 75 \\ \hline \end{array}$$

Here are 5 decimal places in both the fractions, therefore all the product is pointed off for decimal parts.

$$\begin{array}{r} 4375 \\ 6125 \\ \hline \end{array}$$

,65625 Answ. 13s. 1d. $\frac{2}{3}$

II. When a compound fraction is to be multiplied by a simple one, according to the 19th rule in *Reduction of Fractions*, and work as before.

Example. Multiply $\frac{3}{4}$ of a *l.* by $\frac{5}{8}$ of $\frac{3}{4}$ of a *l.* The compound fraction being reduced, makes $\frac{15}{128}$, which multiplied by $\frac{3}{4}$, produces $\frac{45}{128}$, or 3s. 6d.

When a fraction or mixt number, is to be multiplied by a whole number, constitute a unit for a denominator to the whole number, and then it becomes an improper fraction; then work as before.

Example. Multiply 24 by $\frac{3}{7}$ (that is $2\frac{4}{7}$ by $\frac{3}{7}$) facit $4\frac{8}{7}$.

Multiply *l.* 12 by $\frac{3}{4}$ of a *l.*

$2\frac{3}{4}$ per $\frac{3}{4}$, answer $3\frac{9}{8}$ or 4*l.* 10s.

Decimally

$$\begin{array}{r} ,375 \\ ,12 \\ \hline \end{array}$$

Facit, 4,500 or 4*l.* 10s.

III. When a mixt number is to be multiplied by a fraction, reduce the mixt number into an improper fraction, and work as before.

Example. $16\frac{1}{2}$ by $\frac{4}{11}$

$$\begin{array}{r} 2 \\ \hline 33 \\ \hline \end{array}$$

3 per $\frac{4}{11}$, Facit $3\frac{11}{11}$.

Multiply $7\frac{1}{4}$ by $\frac{1}{4}$ of a yard. Facit $\frac{29}{16}$, or $5\frac{9}{16}$ yards.
Deci-

7,25

.75362550575,5375

IV. To multiply mixt numbers by mixt numbers ; that is, a whole number and a fraction by a whole number and a fraction.

Rule. Reduce the given numbers into improper fractions, and work as before.

Example. Multiply $120\frac{3}{4}$ by $48\frac{1}{2}$

4	2	4	
<u>—</u>	<u>—</u>	<u>—</u>	
481	481	97	8 Denom.
<u>—</u>	<u>—</u>	<u>—</u>	<u>—</u>
4	—	2	
<u>—</u>	<u>—</u>	<u>—</u>	
3367			
<u>—</u>			
4329			

Denominator, 8)46657

Answer 5832 $\frac{1}{2}$ feet

Or thus: First multiply the whole numbers together, as 120 by 48 ; and to the product add $\frac{3}{4}$ of 48, and of 120.

Example.

Decimally.

120.25

48.5

60125

96200

481005832.125120 $\frac{3}{4}$ long.48 $\frac{1}{2}$ broad.960

480

60 the $\frac{3}{4}$ of 12012 the $\frac{1}{2}$ of 485832 $\frac{1}{2}$ Answ.

Then

Then multiply the fractions by themselves, saying, once 1 is 1, and twice 4 is 8; which produces the $\frac{1}{4}$, as in the *Example*.

And thus by either of these ways, having the length and breadth of any superficial quantity, its contents may be found.

Multiply $2s. \frac{2}{4}$ by $3s. \frac{2}{4}$.

$$\begin{array}{r} 3 \frac{2}{4} \\ \times 3 \frac{2}{4} \\ \hline 6 \\ 1 \\ 1 \\ \hline \end{array}$$

Facit. $8 \frac{2}{4}$, or $8s. 2d.$

Or $2s. 4d.$ by $3s. 6d.$

(2)

$$\begin{array}{r} \text{Or thus: } s. \quad d. \\ 2 \quad 4 \\ \times 3 \quad 6 \\ \hline 6 \quad 0 \\ 1 \quad 0 \\ 1 \quad 2 \\ \hline \end{array}$$

Or thus (3)

$$\begin{array}{r} 2 \quad 4 \\ \times 3 \quad 6 \\ \hline 7 \quad 0 \\ 1 \quad 2 \\ \hline 8 \quad 2 \end{array}$$

Ans^r 8 2

Decimally

$$\begin{array}{r} 2.333 \\ \times 3.5 \\ \hline \end{array}$$

$$\begin{array}{r} 11665 \\ 6999 \\ \hline \end{array}$$

8.1655 Ans. $8s. 2d.$

The second of these ways is called *Cross Multiplication* or *Duo decimals*, by which shillings and pence may be multiplied by shillings and pence; or feet and inches by feet and inches, carrying the same from one denomination to the next: for as 12 pence makes a shilling, so does so many inches a foot. In the work I first multiply the whole numbers by themselves saying, 3 times 2 is 6; then cross ways, I say 6 times 2 is 12d. or 1s. and 3 times 4 is 12d. or 1s. Then the pence by the pence, saying 6 times 4 is 24, which I divide, by 12, saying the 12's in 24, twice, &c.

D d

But

But the third and best way is wrought *practically*, and the last *decimally*; each method producing the same answer as may be seen in each work.

	<i>l.</i>	<i>s.</i>	<i>d.</i>		<i>l.</i>	<i>s.</i>	<i>d.</i>
Multiply 3	15	9		84	13	6	
By	1	47	6	1	17	3	
	15	3	0	338	13	0	<i>p. 4 & 4</i>
2 <i>s.</i> 6 <i>d.</i> $\frac{1}{4}$		9	$5\frac{1}{2}$			4	
ditto		9	$5\frac{1}{2}$				
ditto		9	$5\frac{1}{2}$	1354	16	0	
				84	13	6	
Facit. <i>l.</i> 16	11	$4\frac{1}{2}$		8	9	$4\frac{1}{2}$	
				4	4	$8\frac{1}{2}$	
				<i>l.</i> 1452	3	$6\frac{1}{2}$	

By the same method may be multiplied weight or measure.

DIVISION.

I. If the fractions are single, and have a common denominator, divide the one numerator by the other, and place the quotient over the denominator.

Examples.

Divide $\frac{6}{8}$ by $\frac{3}{8}$, Facit $\frac{2}{1}$

Divide $\frac{9}{11}$ by $\frac{3}{11}$, Facit $\frac{3}{1}$

Divide $\frac{27}{11}$ by $\frac{3}{11}$, Facit $\frac{9}{1}$

II. *Division of Decimals* is worked just as it is in whole numbers; only when the work is over, you must point off as many places from the quotient, for decimal parts, as the dividend has more than the divisor; that is, there must be as many decimal places in the divisor and quotient as there are in the dividend; but

but if not, the defect must be supplied by cyphers being annexed to the left hand of the quotient, and is just the converse of Multiplication of decimals.

III. When the divisor consists of more places than the dividend, a competent number of cyphers must be annexed to the dividend, before you can make a division.

Example. Let us divide the first sum on the other side *Decimally*; when the fractions are reduced to decimals, they make ,75, to be divided by ,375, wherefore I join two cyphers to the dividend, ,75, thus, ,7500, and then divide as in whole numbers.

$$\begin{array}{r} .375 \overline{) 7500} \quad (20 \text{ or } 2 \\ \underline{750} \\ (0) \end{array}$$

IV. When in vulgar fractions, the dividend and divisor are both simple fractions, then multiply the numerator of the dividend by the denominator of the divisor, for a numerator; and also multiply the denominator of the dividend into the numerator of the divisor, for a denominator, and the work is done.

Example.

What is the quotient of $\frac{4}{7}$ of a *l.* divided by $\frac{3}{4}$ of a *l.*

$$\begin{array}{l} \frac{4}{7} \div \frac{3}{4} = \frac{4}{7} \times \frac{4}{3} \text{ Answer} \\ \text{Divide } \frac{4}{7} \text{ by } \frac{3}{4}, \text{ Facit } \frac{16}{21} \text{ or } \frac{7}{7}. \end{array}$$

Or you may reduce the fractions to a common denominator, and then divide the new numerator of the dividend by the new numerator of the divisor.

D d 2

Example,

*Example.*Divide $\frac{1}{2}$ by $\frac{2}{3}$ $\frac{1}{6}$, $\frac{1}{6}$.126)144(1 $\frac{1}{2}$ Answ.

V. To divide a whole number by a fraction, multiply the integer by the denominator of the fraction, and divide by the numerator.

*Example.*Divide 15 yards by $\frac{1}{2}$ 30 $\frac{0}{10}$ Anf.

Decimally.

75)15.00(20 or .2

150.

(0)

VI. To divide a fraction by a whole number, let the numerator stand as numerator, and multiply the integer into the denominator for a denominator.

*Example.*Divide $\frac{2}{3}$ of an ell by 9 ells, Facit $\frac{2}{27}$.

Decimally.

9).400(

.044 Answ.

VII.

VII. To divide a mixt number by a whole number, reduce the mixt number into an improper fraction, and by its denominator multiply the integer for a divisor.

Example.

Divide $5 \frac{1}{2}$ yards	by 4 yards
$\begin{array}{r} 4 \\ \hline 23 \\ \hline 4 \end{array}$	$\begin{array}{r} 4 \\ \hline 16) 23(1 \frac{7}{8}, \text{ Answ.} \\ \hline 16 \\ \hline 7 \end{array}$
$\begin{array}{r} \hline 4) 5.750 \\ \hline \end{array}$	
Decimally.	
Facit, 1.437	

VIII. To divide a mixt number by a fraction, reduce the mixt number into an improper fraction, and then multiply the numerator of the improper fraction, by the denominator of the fraction, and the denominator of the improper fraction by the numerator.

Example.

Divide $1. 12 \frac{2}{3}$ by $\frac{2}{3}$

$\begin{array}{r} 3 \\ \hline 38 \\ \hline 3 \end{array}$	$\begin{array}{r} 38 \\ 8 \end{array}$
$\begin{array}{r} 3 \\ \hline 5 \end{array}$	$\begin{array}{r} 15) 304(20 \frac{4}{5}, \text{ Answer.} \\ \hline 30 \\ \hline 4 \end{array}$
Decimally.	
$\begin{array}{r} 15) 12.666003(20.265 \text{ Answer.} \\ \hline \end{array}$	

IX. To divide a whole number by a mixt number, reduce the mixt and whole numbers into improper fractions, and work as before.

D d 3

Example

Example.

$\begin{array}{r} 48 \\ 2 \\ \hline 25 \overline{)96} \end{array}$	$\begin{array}{r} 48 \\ 12\frac{1}{2} \\ \hline 1 \\ 25 \\ \hline 2 \end{array}$
$\begin{array}{r} 75 \\ \hline 21 \\ \hline \end{array}$	$\begin{array}{r} 12,548,000 \\ 3,84 \\ \hline \end{array}$

25)96(4 $\frac{3}{4}$ Answer.

Decimally
12,548,000(3,84 Answer.

X. To divide a mixt number by a mixt number, bring them into proper fractions, and work as before.

Example.

$\begin{array}{r} \text{Decimally.} \\ 5,5 \overline{)8,750} \end{array}$	$\begin{array}{r} \text{Divide } 8\frac{1}{2} \text{ yards by } 5\frac{1}{2} \text{ yards} \\ 4 \quad 2 \\ \hline 35 \quad 11 \\ \hline 4 \quad 2 \\ \hline 44 \overline{)70} \end{array}$
$\begin{array}{r} 55 \\ \hline 325 \\ 275 \\ \hline 500 \\ 495 \\ \hline (5) \end{array}$	$\begin{array}{r} 44 \overline{)70} \end{array}$

The RULE of THREE.

Here, as in the whole numbers, the first and third numbers must be of one denomination; and as is the stating, so is the operation the same, viz. second and third numbers are multiplied together, and that product divided by the first; according to the foregoing rules of working fractions.

Example.

If $\frac{1}{2}$ yard of cloth cost $\frac{4}{7}$ of a £ . what $\frac{3}{8}$ yard.

$$\begin{array}{r} 5 \\ \hline 30 \end{array}$$

Ans. $\frac{8}{9}$ or 17s. 9d $\frac{1}{3}$.

There is another and better way of working the question, when it is stated, which is thus.

Multiply the numerators of the first into the denominators of the second and third fractions, for a new denominator; and then the denominator of the first fraction into the numerators of the second and third, for a new numerator; which if an improper fraction, may be reduced into a whole or mixt number.

If $\frac{3}{4}$ yard cost $\frac{4}{5}$ l. what $\frac{5}{6}$ yard. Answ. $\frac{30}{16}$, or $\frac{3}{2}$.

3

15



90

Facit $\frac{16}{9}$, or $\frac{8}{9}$ as before.

The foregoing question wrought decimally.

Yards. *l.* *Yards.*
If ,75 cost ,8 what ,833
 ,8

,75), 66640(,888 Answ. or 17s. 9d. $\frac{1}{2}$

15.

lb.	s.	lb.
If $2\frac{1}{2}$ tobacco cost $3\frac{1}{2}$ what $242\frac{1}{2}$		
<u>4</u>	<u>2</u>	<u>4</u>
11	7	969
<u>4</u>	<u>2</u>	<u>4</u>
7	11	
<u>28</u>	<u>22</u>	
969	4	
252	88 Denominator.	
168		
252	27132	
27132 Numerator 88	Answer.	
	88)27132(30 8	
	15-8-3 $\frac{1}{2}$ Facit.	

Decimally.

lb.	s.	lb.
If 2.75	3.5	242.25
	<u>3.5</u>	
	121125	
	<u>72675</u>	
2.75	847.875(30 8.3	
Answer	15-8-3 $\frac{1}{2}$	

Here the operation is just as it is in whole numbers.

Before

Before I conclude, I shall work some examples in interest by decimals, by which may be seen, that the decimal way, in some cases, has the advantage of the vulgar.

Simple Interest.

Example 1. What is the amount of a year's interest of 826*l.* 13*s.* 9*d.* at 5 *per Cent.*

$$\begin{array}{r} 826,687 \\ ,05 \\ \hline \end{array}$$

Answer, 41,33435 Or, *l.* 41 *6* 8½ according to the rule of valuing a decimal in reduction of fractions.

Here the 13*s.* 9*d.* is reduced to the decimal, .687, and annexed to the whole number, 826*l.* with the decimal characteristic between them; which multiplied by .05 the decimal of the rate, *viz.* 5 *per Cent.* which is found by annexing cyphers to the rate, and dividing by 100, thus,

per Cent.

$$100)5000(,05$$

according to the way of valuing the quotient in Division of Decimals, *viz.* the quotient must have as many decimal places as the dividend exceeds the divisor. After the same manner the decimal for 4 *per Cent.* is found to be .04, and of 6, .06, &c.

Example

Example.

What is the year's interest of 348*l.* 13*s.* 2*d.* at 6 per Cent. per Annum?

$$\begin{array}{r} \text{£. } 348,658 \\ \quad ,06 \\ \hline \end{array}$$

20,91948 Answer *£.* 20-18-4 $\frac{1}{2}$

Here there are as many decimal places separated to the right hand, as there are decimal places in both multiplicand and multiplier, according the rule of multiplication in decimals (as in the foregoing example also) and the decimal parts are found to be 18*s.* 4*d.* $\frac{1}{2}$, according to the rule of valuing a decimal of money, &c.

Example 3.

What's the interest of

$$\text{£. } 326 \text{ — at — } 4 \text{ per Cent.}$$

13,04 Answer *£.* 13-00-9 $\frac{1}{2}$

When the simple interest of any sum is required for 2, 3, 4, or 5 years, &c. it's only to find the interest for 1 year, and then to multiply that interest by 2, 3, 4, or 5, &c.

Example

Example 4.

What's the interest of 324*l.* 10*s.* for 4 years, at 4 per Cent. per Annum?

l.

324,5
 ,04

12,980 Answer for 1 year *l.* 12 19 7½
 years 4

Ans*w.* *l.* 51 18 5

If the interest required be for parts of a year, i. e. months, &c. take such parts of the year's interest; as 6 months is the $\frac{1}{2}$, 3 months the $\frac{1}{4}$, and 4 months the $\frac{1}{3}$, &c.

To find the interest of any sum of money, for any number of days, at any rate of interest.

Rule. Multiply the principal by the rate of interest, and then that product by the number of days, which reserve for a dividend, (which divided by 365,00 the common divisor for all rates, the days of the year multiplied by 100) answers the question.

Example 5.

What's the interest of 240*l.* for 96 Days, at 5 per Cent. per Annum?

5
 1200
 96

365,00,1152,00 Ans*.* *l.* 3 3 1½.

Likewise

312 Of FRACTIONS, &c. Chap. XIX

Likewise there may be found decimal numbers correspondent to the duty or custom on Tobacco, Holland cloth, viz.

	240lb.	
		Old subsidy ,95
1d. per lb.	1lb.	New subsidy ,92625
5 per Cent. cut off	,05	Addit. Duty ,87875
		$\frac{1}{2}$ New subsidy ,29485625
Old subsidy	$\frac{1}{2}$	Impost 2.484
2 $\frac{1}{2}$ per Cent. off	$\frac{1}{2}$	
		Duty of } 5,53385623
New subsidy	,92625	240l. }
5 per Cent. more off		
the Old viz. 7d. $\frac{1}{2}$	} ,0475	
Additional duty	,87875	
$\frac{2}{3}$ of the new sub- sidy with 4p. Ct. off	} ,30875 } ,01389375	
	,29485625	
3d. per lb	3,0	
10 per Ct. off	,3	
	2,7	
8 per Ct. off	,216	
	Impost 2,484	

And so for Holland cloth.

So some of the rules of practice may be work'd by decimals, but shorter by vulgar fractions.

F I N I S.

2.
rs
o)

5

3

d